VPDES PERMIT FACT SHEET

This document gives pertinent information concerning the reissuance of the VPDES permit listed below. This permit is being processed as a minor, municipal permit. The effluent limitations contained in this permit will maintain the Water Quality Standards of 9 VAC 25-260 et seq. The discharge results from the operation of a sewage treatment plant at a small private children's home. This permit action consists of updating the permit to reflect changes in the Water Quality Standards, Guidance Memos, and the VPDES Permit Manual. SIC Code: 8361.

1. **Facility Name:** Children's Home of Virginia Baptist, Inc
Address: 6900 Hickory Road
Petersburg, VA 23803

Location 6900 Hickory Road
Petersburg, VA 23803

2. **Permit Number** VA0027561
Existing Permit Expiration Date: October 15, 2008

3. **Owner Contact**
Name: Ms. Jean Cobb
Title: Assistant Director
Telephone No: 804-590-2080

4. **Application Complete Date:** January 14, 2009 (with receipt of winter temperature data)
Permit Drafted By: Jaime Bauer, Piedmont Regional Office
Reviewed By: Gina Kelly **Date:** November 3, 2008
Reviewed By: Curt Linderman **Date:** November 25, 2008

Public Notice
Name of Paper: Petersburg-Dinwiddie Monitor
Dates: First Publication Date: February 11, 2009
Second Publication Date: February 18, 2009
Public Comment Period: February 11, 2009 to 4 pm on March 13, 2009

5. **SCC Certification Verification as required by Section 62.1-44.15:3 of the State Water Control Law:** Applies only to privately owned treatment works that treat sewage generated by private residences serving or designed to serve 50 or more residents. According to the VPDES permit application, the collection system serves a population of 40.

6. **Financial Assurance/Closure as required by 9 VAC 25-650-10:** Applies only to privately owned treatment works that treat sewage generated by private residences with design flows between 1,000 gpd and 40,000 gpd. This facility is a children's home. If the operation was to close down, flow to the system would cease; therefore, financial assurance is not required. In addition, this facility is not listed in GM 01-2002, Appendix B, as a facility subject to 9 VAC 25-650.

7. **Receiving Stream Name:** Unnamed Tributary to Church Branch
Basin: Appomattox
Section: 5c
Class: III
Special Standards: None
The Water Quality Standards designates special standard NEW-2 for section 5c; however, the facility proposed discharge point is downstream of the segment defined in NEW-2.

River Mile:	2DXAB000.48			
7-Day, 10-Year Low Flows:	0	MGD	0	cfs
1-Day, 10-Year Low Flows:	0	MGD	0	cfs
30-Day, 5-Year Low Flows:	0	MGD	0	cfs
30-Day, 10-Year Low Flows:	0	MGD	0	cfs
7-Day, 10-Year High Flows:	0	MGD	0	cfs
1-Day, 10-Year High Flows:	0	MGD	0	cfs
30-Day, 10-Year High Flows:	0	MGD	0	cfs
1-Q30 Flows	0	MGD	0	cfs
Harmonic Mean Flow:	0	MGD	0	cfs
Tidal:	No			
On 303(d) List:	No – However the facility received a wasteload allocation in the Appomattox TMDL. See Section 27 of this Fact Sheet for more information.			

See Flow Frequency Memo (Attachment 1)

8. **Operator License Requirements**: No operator is currently required. However, upon facility upgrade Class IV operator is required.

(9 VAC 25-790-300)

9. **Reliability Class**: Class II
(9 VAC 25-790-70)

10. **Permit Characterization:**

X Private ___ Federal _____ State __ POTW X PVOTW

___ Possible Interstate Effect _____ Interim Limits in Other Document

11. **Table 1: Wastewater Flow and Treatment**

Outfall Number	Discharge Source	Treatment	Flow Design Capacity
001	Children's Home	Stabilization Lagoon	0.010 MGD

(See Attachment 2 for facility diagram)
The facility is currently operating as a no discharge lagoon. If and when a discharge occurs, the facility must meet the effluent limitations outlined in Part I.A of the permit. It is assumed that the current treatment system, a stabilization lagoon, will not consistently produce an effluent that complies with all the limitations in Part I.A, and disinfection and/or post aeration systems may have to be provided. Therefore, if discharge occurs, new treatment facilities will be needed. As indicated in the appropriate special condition, the upgraded facility will require a certified operator and will have to be constructed to meet stated reliability requirements. Construction of treatment facilities will not require modification of the permit as long as the design capacity of the upgrade is 10,000 gallons per day or less.

12. **Sewage Sludge Use or Disposal:**
The sludge is stored in the lagoon, and the lagoon has not yet had to be pumped. When sludge disposal is necessary, the permittee has indicated that a licensed contractor will be obtained to pump, haul and dispose of the sludge to a permitted facility.

13. **Discharge Location Description**:
The facility discharges to an unnamed tributary of Church Branch. See Attachment 3 for the Chester Quadrangle topographic map (099C).

14. **Material Storage**:
No materials currently stored on site. A special condition has been included in the permit requiring proper storage of materials when applicable.

15. **Ambient Water Quality Information**: Due to the intermittent nature of the tributary, data obtained from wastewaters residing within the lagoon reported in the Form 2A application were used as ambient water quality data for wasteload calculations and permit limitation development per the advice of J. Palmore, Senior Environmental Engineer Planning Staff.

16. **Antidegradation Review & Comments: Tier 1 __X__ Tier 2 _____ Tier 3 _____**
The State Water Control Board's Water Quality Standards includes an antidegradation policy (9 VAC 25-260-30). All state surface waters are provided one of three levels of antidegradation protection. For Tier 1 or existing use protection, existing uses of the water body and the water quality to protect these uses must be maintained. Tier 2 water bodies have water quality that is better than the water quality standards. Significant lowering of the water quality of Tier 2 waters is not allowed without an evaluation of the economic and social impacts. Tier 3 water bodies are exceptional waters and are so designated by regulatory amendment. The antidegradation policy prohibits new or expanded discharges into exceptional waters.

The antidegradation review begins with a Tier determination. The receiving stream, an UT to Church Branch, is the headwaters of a small stream. It is considered to be a Tier 1 water body because it's flows are expected to be negligible. This determination is based on the intermittent nature of the stream where beneficial uses cannot be fully attained. The unnamed tributary was not assessed during the 2006 or draft 2008 305(b)/303(d) Water Quality Assessments and the waters are therefore considered Category 3A.

17. **Site Inspection**: The Piedmont Regional Office Water Compliance Staff performed a site visit on October 7, 2008 at the request of permitting and enforcement staff. The facility contact called permitting and enforcement staff to report that part of the influent pipe appeared missing. After arriving at the facility and viewing the stabilization pond, it is the professional judgment of the compliance staff that the influent pipe became detached from the rest of the pipe and sank to the bottom of the pond. Even though a segment of the influent pipe is missing, wastewater is still adequately being directed to the stabilization pond, and treatment does not appear to be affected. See Attachment 4 for more details.

18. **Effluent Screening & Limitation Development**:

EFFLUENT CHARACTERISTICS	BASIS FOR LIMITS	DISCHARGE LIMITATIONS					
		MONTHLY AVERAGE		WEEKLY AVERAGE		MIN	MAX
Flow (MGD)	NA	NL		NA		NA	NL
pH (standard units)	1,2	NA		NA		6.0	9.0
BOD_5	2	30 mg/L	1100 g/d	45 mg/L	1700 g/d	NA	NA
TSS	2	60 mg/L	2300 g/d	90 mg/L	3400 g/d	NA	NA
TRC	1	0.0080 mg/L		0.0098 mg/L		NA	NA
Dissolved Oxygen	1	NA		NA		5.0 mg/L	NA
Ammonia as N	1	4.44 mg/L		4.44mg/L		NA	NA
E. coli	3	126 N/100 mL Geometric Mean		NA		NA	NA

1. Water Quality Based Limit 2. Federal Effluent Guideline 3. Other

Permit limitation development for toxic pollutants began with obtaining flow frequency and stream data from the DEQ water planning staff. Since the facility will potentially discharge to an intermittent stream where the effluent is the stream, 100% mix was assumed and used in the MSTRANTI spreadsheet. As previously indicated, the facility has not had a discharge; therefore, there is no effluent data available for use in computing effluent limitations. Water quality data from wastewaters residing within the lagoon submitted with the Form 2A application was used in limitation development in lieu of monthly effluent data. The Wasteload Allocations (WLA) were calculated using the MSTRANTI spreadsheet. Hardness for both stream and "effluent" data was assumed to be 25 mg/L based on a conservative best professional judgment since no other data was available. See Attachment 5 for permit limitation development documents.

pH: A pH range of 6.0 – 9.0 Standard Units is assigned to all Class III waters per the Virginia Water Quality Standards, 9 VAC 25-260-50 and federal effluent limit guidelines for secondary treatment (40 CFR 133.102).

Limitation Determination for Biological Oxygen Demand (BOD_5) and Total Suspended Solids (TSS) for Waste Stabilization Ponds:

The BOD_5 effluent limits are set to 30 and 45 mg/L monthly and weekly averages, respectively. These limits are specified in the secondary treatment standard in 40 CFR 133.102 and assigned in accordance with the VPDES Permit Manual guidance flow chart for facilities using waste stabilization ponds for treatment. Data submitted in the Form 2A indicates that the facility will be able to meet secondary standards for BOD_5 and therefore equivalent secondary standards do not apply even though treatment is with the use of a stabilization pond. In order to meet the ammonia limitation of 4.0 mg/L, the facility will need to install treatment such as aeration which will facilitate the facility being able to meet the secondary BOD_5 standard of 30 mg/L.

It is staff's professional judgment based on knowledge of similar facilities that this facility may not be able to meet the secondary treatment standards for TSS even though the application shows demonstration with the secondary treatment standard. The facility is being minimally used by only a few staff members on site. If the facility was to become re-accredited and children were placed at the facility, there is a concern that the TSS secondary standard may not be met. Consequently, the data submitted with the permit application may not be representative of the effluent under designed operating conditions and secondary treatment standards for TSS may not be achieved. In previous permit issuances, the TSS limitations were set at equivalent secondary standards. Following the flow chart for TSS limitation determination, facilities using waste stabilization ponds for treatment that cannot meet TSS limitations of 30 mg/L or 45 mg/L are to be assigned equivalent to secondary standards of 60 mg/L monthly average if located east of the Blue Ridge Mountains. Secondary limits and equivalent secondary limits are based on the federal effluent limit guidelines for secondary treatment (40 CFR 133).

Facilities using waste stabilization ponds for treatment that cannot meet secondary standards are required to meet equivalent to secondary standards. In accordance with 40 CFR 133.105 and the VPDES Permit Manual, the equivalent secondary treatment standard for TSS for facilities east of the Blue Ridge Mountains (60 and 90 mg/L monthly and weekly average, respectively) is being applied.

Total Residual Chlorine (TRC): A limitation evaluation was conducted for TRC. The chronic and acute WLAs were calculated using the MSTRANTI Excel Spreadsheet. Acute and chronic WLA for TRC were calculated as 0.0019 mg/L and 0.0011 mg/L, respectively. Following the procedures in GM 00-2011, since the WLAa was less than 4.0 mg/L, the actual WLA were entered into STATS.exe to determine the need for a permit limitation and calculate the limitation. A quantification level of 0.10 mg/L and a data point of 20 mg/L were used as recommended by the VPDES permit manual. The evaluation produced recommended limitations of 0.0080 mg/L for average monthly and 0.0098 mg/L for average weekly in order to protect water quality (See Attachment 5).

Dissolved Oxygen (DO): The minimum DO criteria for class III waters in the Virginia Water Quality Standards (WQS) is 5.0 mg/L.

Ammonia: A limitation evaluation was conducted for ammonia using the MSTRANTI Excel Spreadsheet to calculate acute and chronic WLAs. The WLAs are entered in to the STATS.exe computer application to

determine the need for a permit limitation and calculate the limitation. Acute and chronic WLAs of 27 mg/L and 2.2 mg/L, respectively, were entered into STATS.exe with a quantification level of 0.20 mg/L. The procedures established in Virginia DEQ Guidance Memo 00-2011 recommend inputting a single datum point of 9.00 mg/L into the program. The evaluation resulted in a recommended permit weekly and monthly average limitation of 4.44 mg/L. See Attachment 5.

E. coli: The facility received an E. coli wasteload allocation of 1.75+ 10 cfu/yr in the Appomattox River bacteria TMDL. The wasteload allocation is based on the facility's permitted flow of 0.010 MGD and an E. coli count of 126 N/100 mL. The frequency of 2 per Month requires that each sample be separated by at least 7 days as long as chlorination is the disinfection method.

19. **Basis for Sludge Use & Disposal Requirements:**
N/A – Sludge from this facility is not land applied nor does the permit require sludge monitoring or limits.

20. **Antibacksliding Statement**:
9VAC 25-31-220.L and DEQ Guidance Memo 00-2011 do not allow re-issued permits to contain a less stringent water-quality based effluent limitation, unless under certain specified exceptions.

With the exception of ammonia, all limits are at least as stringent as in the previous permit. Ammonia limitations were 4.0 mg/L but have been increased to 4.44 mg/L. Because the facility has not yet discharged, the 4.0 limitation never became effective and thus, in raising the limitation to 4.44 mg/L backsliding did not occur.

21. **Special Conditions:**

B. Additional Chlorine Limitations and Monitoring Requirements
Rationale: Required by VA Water Quality Standards, 9 VAC 25-260-170 Bacteria: other waters. Also, 40 CFR 122.41(e) requires the permittee, at all times, to properly operate and maintain all facilities and systems of treatment in order to comply with the permit. This ensures proper operation of chlorination equipment to maintain adequate disinfection.

C.1. 95% Capacity Reopener
Rationale: Required by VPDES Permit Regulation, 9 VAC 25-31-200 B 2 for all POTW and PVOTW permits.

C.2. CTC, CTO Requirement
Rationale: Required by Code of Virginia §62.1-44.19; Sewage Collection and Treatment Regulations, 9 VAC 25-790.

C.3. O&M Manual Requirement
Rationale: Required by Code of Virginia § 62.1-44.19; Sewage Collection and Treatment Regulations, 9 VAC 25-790; VPDES Permit Regulation, 9 VAC 25-31-190 E.

C.4. Materials Handling/Storage
Rationale: 9 VAC 25-31-50 A. prohibits the discharge of any wastes into State waters unless authorized by permit. Code of Virginia Section §62.1-44.16 and §62.1-44.17 authorizes the Board to regulate the discharge of industrial waste or other waste.

C.5. Licensed Operator Requirement
Rationale: The VPDES Permit Regulation, 9 VAC 25-31-200 C. and the Code of Virginia § 54.1-2300 et seq, Rules and Regulations for Waterworks and Wastewater Works Operators (18 VAC 160-20-10 et seq.), require licensure of operators. Since the facility does not discharge, no licensed operator is required until the upgrade is complete.

C.6. Reliability Class

Rationale: Required by Sewage Collection and Treatment Regulations, 9 VAC 25-790 for all municipal facilities. The facility is being required to meet a reliability class II upon upgrade.

C.7. Sludge Reopener

Rationale: Required by VPDES Permit Regulation, 9 VAC 25-31-220 C for all permits issued to treatment works treating domestic sewage.

C.8. TMDL Reopener

Rationale: Section 303(d) of the Clean Water Act requires that total maximum daily loads (TMDLs) be developed for streams listed as impaired. This special condition is to allow the permit to be reopened if necessary to bring it into compliance with any applicable TMDL approved for the receiving stream. The re-opener recognizes that, according to section 402(o)(1) of the Clean Water Act, limits and/or conditions may be either more or less stringent than those contained in this permit. Specifically, they can be relaxed if they are the result of a TMDL, basin plan, or other wasteload allocation prepared under section 303 of the Act. This reopener is included in all permits.

C.9. Compliance Reporting

Rationale: Authorized by VPDES Permit Regulation, 9 VAC 25-31-190 J 4 and 220 I. This condition is necessary when pollutants are monitored by the permittee and a maximum level of quantification and/or a specific analytical method is required in order to assess compliance with a permit limit or to compare effluent quality with a numeric criterion. The condition also establishes protocols for calculation of reported values.

C.10. Sludge Use and Disposal

Rationale: VPDES Permit Regulation, 9 VAC 25-31-100 P; 220 B 2; and 420 through 720, and 40 CFR Part 503 require all treatment works treating domestic sewage to submit information on sludge use and disposal practices and to meet specified standards for sludge use and disposal.

C.11. Ground Water Monitoring Plan

Rationale: State Water Control Law § 62.1-44.21 authorizes the Board to request information needed to determine the discharge's impact on State waters. Ground water monitoring for parameters of concern will indicate whether possible lagoon seepage is resulting in violations to the State Water Control Board's Ground Water Standards.

A groundwater monitoring plan was approved December 28, 1994. The facility will continue to monitor ground water to ensure that the system's integrity is being maintained and to indicate if activities at the site are resulting in violations of the State Water Control Board's standards. The approved plan is an enforceable part of the permit. Any changes to the plan must be submitted for approval to the Piedmont Regional Office.

Evaluation of groundwater data is included in Attachment 6. DEQ approved a corrective action plan for potential groundwater impact in February 2007. Since only one set of groundwater monitoring data has been submitted since that time, an additional corrective action plan is not being required. Monitoring shall remain on an annual basis and results shall be submitted to the DEQ, Piedmont Regional Office. Staff will continue to review groundwater data submitted during the term of the permit and require revisions to the corrective action plan as appropriate.
(See Attachment 6 for Ground Water Monitoring Data Evaluation)

C.12. Special Monitoring
Rationale: Required to collect operational data for influent flow and water surface elevation to ensure a "no discharge" status or indicate a potential discharge event.

Part II, Conditions Applicable to All Permits
Rationale: VPDES Permit Regulation, 9 VAC 25-31-190 requires all VPDES permits to contain or specifically cite the conditions listed.

22. **Changes to the Permit:**

Permit Cover Page:	
Item	**RATIONALE**
Initial paragraph	Updated language to reflect current agency guidance that incorporates the permit application as part of the permit.
River Basin, Section, Special Standards	Updated to reflect current Water Quality Standards

Part I.A.							
Outfall No.	**Parameter Changed**	**Monitoring Requirement Changed**		**Effluent Limits Changed**		**Reason for Change**	**Date**
		From	To	From	To		
	BOD_5	-	-	1.1 kg/d 1.7 kg/d	1100 g/d 1700 g/d	Loading limitations converted from units of kg/d to g/d in accordance with GM06-2016.	10/08
	TSS	-	-	2.3 kg/d 3.4 kg/d	2300 g/d 3400 g/d		
	TRC	-	-	8.0 ug/L 9.8 ug/L	0.0080 mg/L 0.0098 mg/L	Updated to reflect agency guidance on significant digits.	11/08
	Ammonia	-	-	4.0 mg/L	4.44 mg/L	Ammonia limitation revised to reflect analysis.	11/08
	E. Coli	-	2/Month	-	126 N/ 100 mL	Bacteria limitation added in accordance with procedures for facilities with a TMDL allocation.	10/08

FROM	**TO**	**RATIONALE**
Footnote (1)	Footnote (1)	Revised language to reflect current agency guidance.
-	Footnote (2)	Added language to reflect current agency guidance.
Footnote (2)	Footnote (3)	Revised language to reflect current agency guidance and clarify TRC requirements.
-	Footnote (4)	Added language to reflect current agency guidance.
Part I.A.1.b	Part I.A.2	No Change
Part I.A.1.c	Part I.A.3	No Change
Special Condition Changes:		

FROM	TO	RATIONALE
B.1	B.1	**Additional Limitations and Monitoring Requirements:** Revised to reflect agency guidance.
B.2	Removed	**Bacterial Limitations** and **Monitoring Requirements:** The demonstration study results were superseded by the need to include an e-coli limitation in conformance with the bacteria TMDL permitting requirements.
C.1	C.1	**95% Capacity Reopener**: Revised to reflect agency guidance.
--	C.2	**CTC, CTO Requirement:** New condition. Added to reflect current agency guidance.
C.2	C.3	**Operations and Maintenance Manual Requirement:** Updated language to reflect current agency guidance.
C.8	C.4	**Materials Handling/Storage:** No Change.
C.3	C.5	**Licensed Operator Requirement:** Language revised for clarity.
C.4	C.6	**Reliability Class:** No Change.
C.6	C.7	**Sludge Reopener:** No Change.
--	C.8	**TMDL Reopener:** New condition. Added to reflect current agency guidance.
C.7	C.9	**Compliance Reporting:** Updated language to reflect current agency guidance on compliance reporting and significant digits.
C.5	C.10	**Sludge Use and Disposal:** Updated language to reflect current agency guidance. Change also reflects transfer of the program from VDH to DEQ.
C.9	Removed	**Treatment Works Closure Plan:** Removed. Language no longer included in agency permit boilerplate.
C.10 and 13	C.11	**Ground Water Monitoring Plan**: Updated language to reflect current agency guidance. Corrective action plan requirement from 2003 permit evaluation has been removed because facility is in the process of implementing the CAP. Boilerplate language remains requiring additional CAP if future monitoring indicates potential ground water contamination. See Attachment 6 Ground Water Monitoring Evaluation
C.11	Removed	**Nutrient Reopener:** Removed. Language no longer included in all permits per current agency guidance.
C.12	C.12	**Special Monitoring:** Language updated.

23. **Variances/Alternate Limits or Conditions**:
None

24. **Regulation of Users (9 VAC 25-31-280 B 9):**
There are no industrial dischargers contributing to the treatment works.

25. **Public Notice Information required by 9 VAC 25-31-280 B**:
All pertinent information is on file and may be inspected, and copied by contacting:

Ms. Jaime Bauer at:
Virginia DEQ Piedmont Regional Office
4949-A Cox Road
Glen Allen, VA 23060
Telephone No. (804) 527-5015
Email Address: jlbauer@deq.virginia.gov

Persons may comment in writing or by email to the DEQ on the proposed permit action, and may request a public hearing, during the comment period. Comments shall include the name, address,

and telephone number of the writer and of all persons represented by the commenter/requester, and shall contain a complete, concise statement of the factual basis for comments. Only those comments received within this period will be considered. The DEQ may decide to hold a public hearing, including another comment period, if public response is significant and there are substantial, disputed issues relevant to the permit. Requests for public hearings shall state 1) the reason why a hearing is requested; 2) a brief, informal statement regarding the nature and extent of the interest of the requester or of those represented by the requester, including how and to what extent such interest would be directly and adversely affected by the permit; and 3) specific references, where possible, to terms and conditions of the permit with suggested revisions. Following the comment period, the Board will make a determination regarding the proposed permit action. This determination will become effective, unless the DEQ grants a public hearing. Due notice of any public hearing will be given.

The public may review the draft permit and application at the DEQ Piedmont Regional Office by appointment.

26. **Additional Comments**:

a. **Previous Board Action**: None

b. **Staff Comments:**

- This facility was granted a waiver from the sample seasonality requirements in Form 2A Item A.12 that requires the facility to collect three effluent samples two of which can be no less than 4 and no more than 8 months apart. In addition, the waiver also approved collection of the samples near the inlet to the outfall standpipe since the facility does not discharge. In accordance with the waiver, the facility collected three samples from wastewaters residing within the lagoon near the inlet to the outfall standpipe taken at least two weeks apart.
- Permittees having exemplary operations that consistently meet permit requirements are considered for reduced monitoring per the VPDES Permit Manual and in accordance with EPA's "Interim Guidance for Performance-Based Reduction of NPDES Permit Monitoring Frequencies" (EPA 833-B-96-001). In order to qualify for reduced monitoring, a facility should not have been issued any Warning Letters, Notice of Violations, or Notices of Unsatisfactory Laboratory Evaluations, or be under any Consent Orders, Consent Decrees, Executive Compliance Agreements, or related enforcement documents during the past three years. There was no consideration given to reduced monitoring frequency since the facility has not had a discharge.
- The application was sent to the Virginia Department of Health by the permittee. Therefore, staff did not forward a copy of the application as required by the VPDES Permit Manual. The response by VDH indicated that they did not object to the re-issuance of the permit. However, they requested a copy of the draft permit for review and comment. On February 9, 2009 a memo was received stating the discharge point is 16.5 miles upstream of the Virginia – American Hopewell water treatment plant. However, there was no objection to the draft permit.
- This permit is required to be reviewed by EPA since the facility received a waste load allocation for bacteria in the Appomattox River TMDL.
- This facility is not subject to the General VPDES Watershed Permit Regulations for Total Nitrogen and Total Phosphorus Discharges and Nutrient Trading in the Chesapeake Bay Watershed in Virginia because the current flow of the facility is less than 40,000 gallons per day (non-tidal significant discharger), and the facility is not expanding. The facility does not have nutrient allocations because the facility is not considered a significant discharger of nutrients. However, the facility has a nutrient permitted design capacity of 569.5 pounds per year Total Nitrogen and 76.1 pounds per year Total Phosphorus, calculated based on secondary technology concentrations values and the current design capacity of 0.010 MGD.
- The permit expired on October 15, 2008. The permit reissuance did not occur prior to expiration due to an incomplete and late application submitted by the permittee.

c. **Public Comment:** None

27. **303(d) Listed Segments (TMDL)**:
The facility discharges to an UT of Church Branch that was not assessed during the 2006 or draft 2008 305(b)/303(d) Water Quality Assessments. However, the facility received an E. coli wasteload allocation of 1.75E+10 cfu/yr in the Appomattox River bacteria TMDL. The wasteload allocation is based on the facility's permitted flow of 0.01 MGD and an E. coli count of 126 N/100 mL. The permit includes an effluent E. coli limitation of 126 N/mL in order to meet the TMDL wasteload allocation.

28. **Summary of Attachments:**
    1. Flow Frequency Memorandum
    2. Facility Diagram
    3. Topographic Map
    4. October 7, 2008 Inspection Report
    5. Permit Limit Development
    6. Ground Water Monitoring Evaluation

Attachment 1 – Flow Frequency Memo

MEMORANDUM

DEPARTMENT OF ENVIRONMENTAL QUALITY
Piedmont Regional Office
4949-A Cox Road Glen Allen, Virginia 23060

SUBJECT: Flow Frequency Determination / 303(d) Status
Children's Baptist Home of Virginia, Inc. – VA0027561

TO: Jaime Bauer

FROM: Jennifer V. Palmore, P.G.

DATE: October 20, 2008

COPIES: File

The Children's Baptist Home of Virginia's sewage treatment plant discharges to an unnamed tributary to Church Branch in Chesterfield County, VA. The discharge is located at rivermile 2DXAB000.48. Stream flow frequencies are required at this site for use by the permit writer in developing effluent limitations for the VPDES permit.

The discharge is located at the headwaters of a small stream. Because the flow at the headwaters is expected to be negligible, the flow frequencies are presented below.

Unnamed tributary at discharge point:

1Q30 = 0.0 cfs	High Flow 1Q10 = 0.0 cfs
1Q10 = 0.0 cfs	High Flow 7Q10 = 0.0 cfs
7Q10 = 0.0 cfs	High Flow 30Q10 = 0.0 cfs
30Q10 = 0.0 cfs	HM = 0.0 cfs
30Q5 = 0.0 cfs	

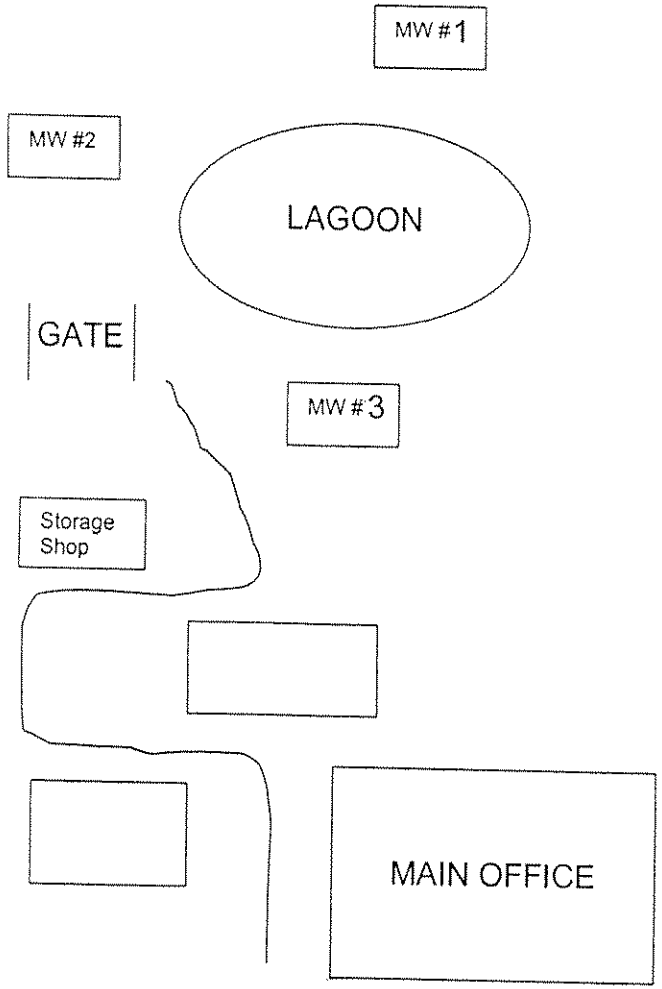
The tributary was not assessed during the draft 2008 305(b)/303(d) Water Quality Assessment report; therefore it is considered a Category 3A water. Although the receiving stream is not impaired for the Recreation Use, the facility was addressed in the bacteria TMDL for the downstream impairment on the tidal Appomattox River. The facility received a wasteload allocation of 1.75E+10 E. coli cfu/year, which was based on a design flow of 0.01 MGD.

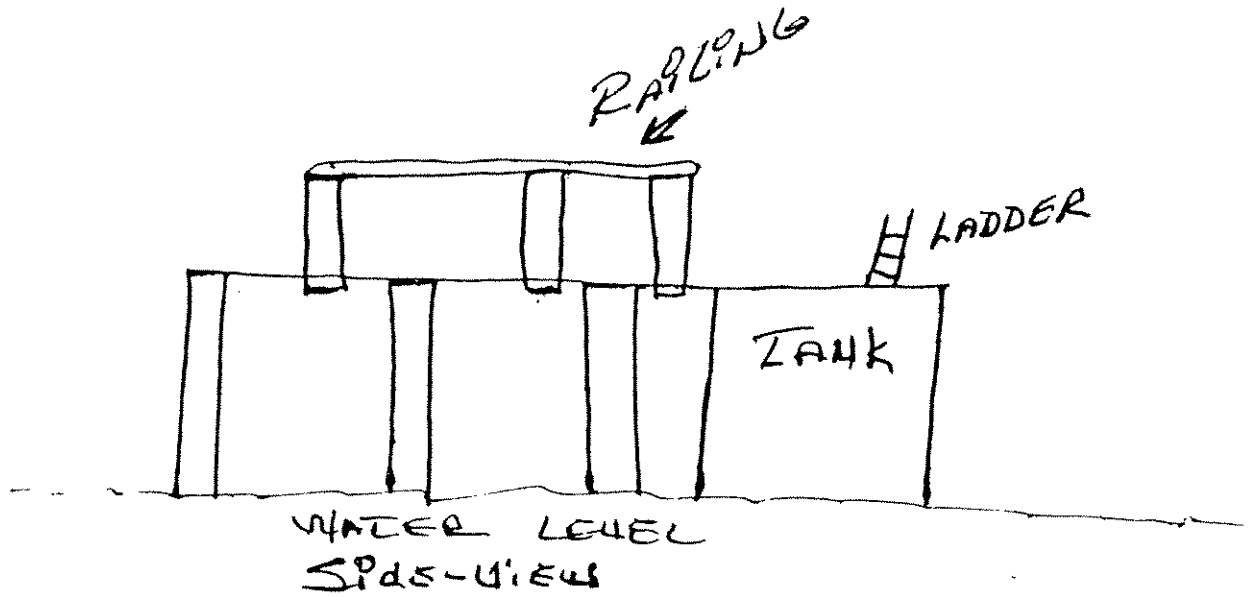
The waterbody has historically been considered a Tier 1 water.

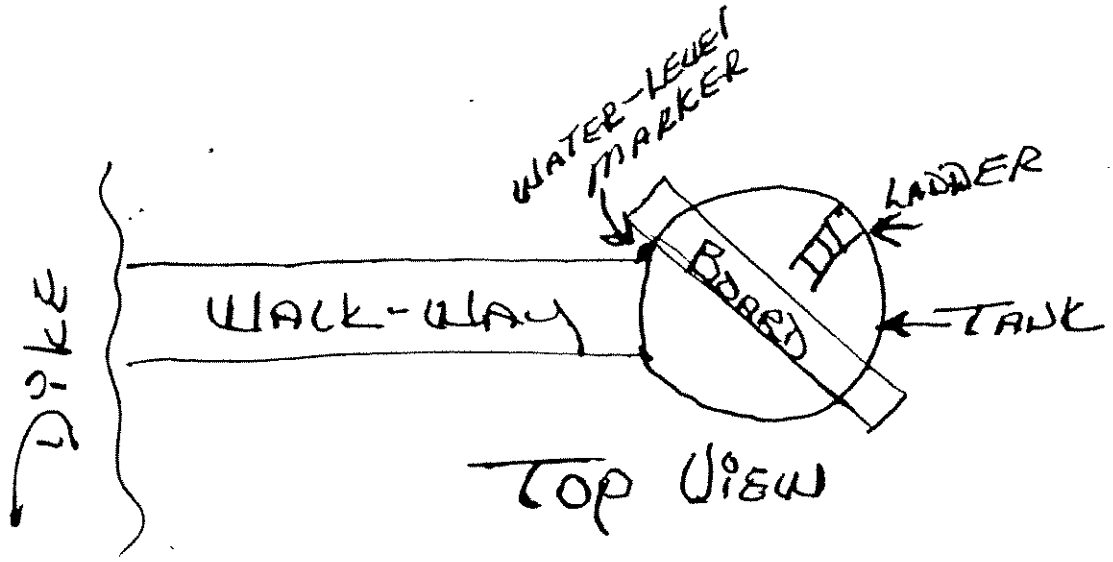
If you have any questions concerning this analysis, please let me know.

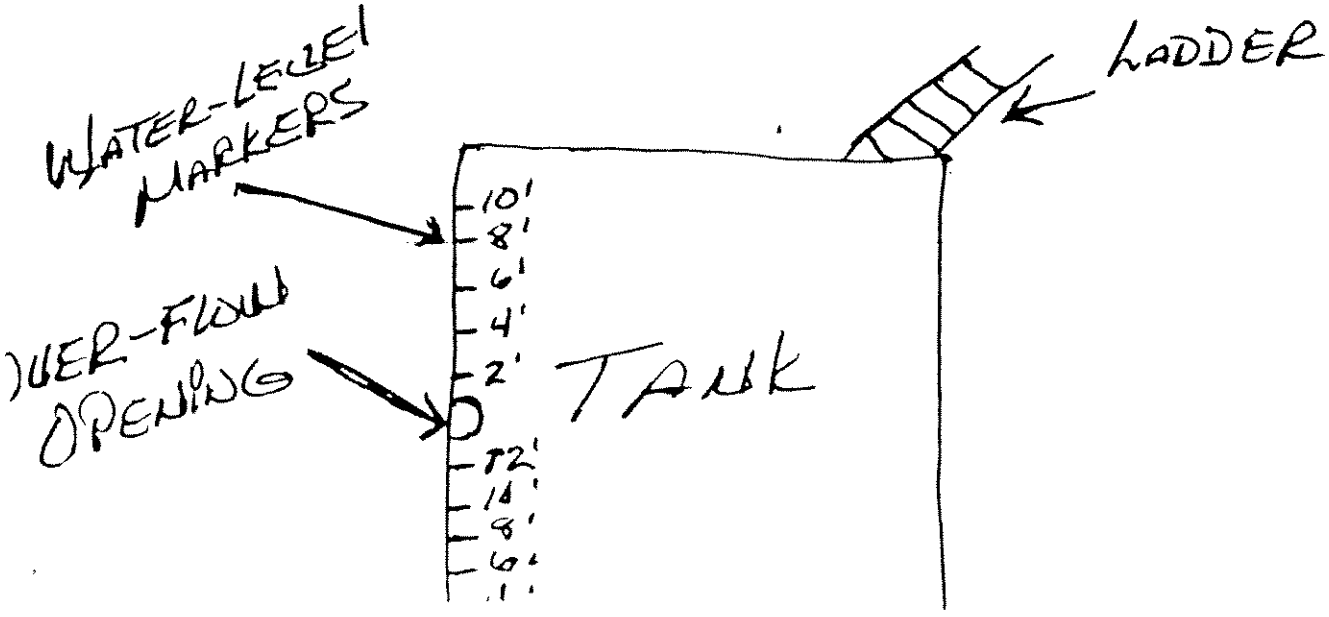
Attachment 2 - Facility Diagram

CHILDREN'S HOME OF VIRGINIA BAPTISTS, INC.

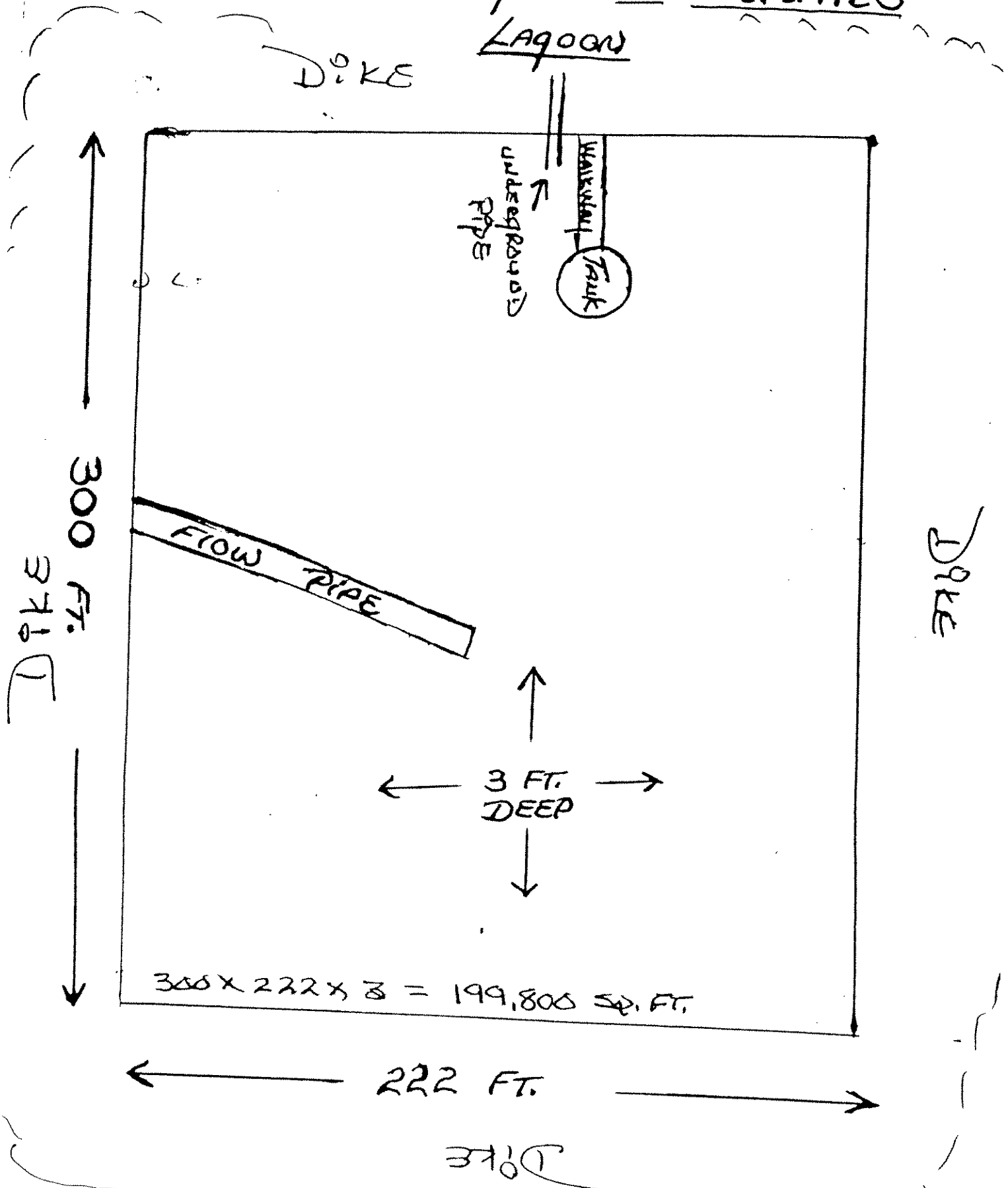



RAILING
LADDER
TANK
WATER LEVEL
SIDE-VIEW

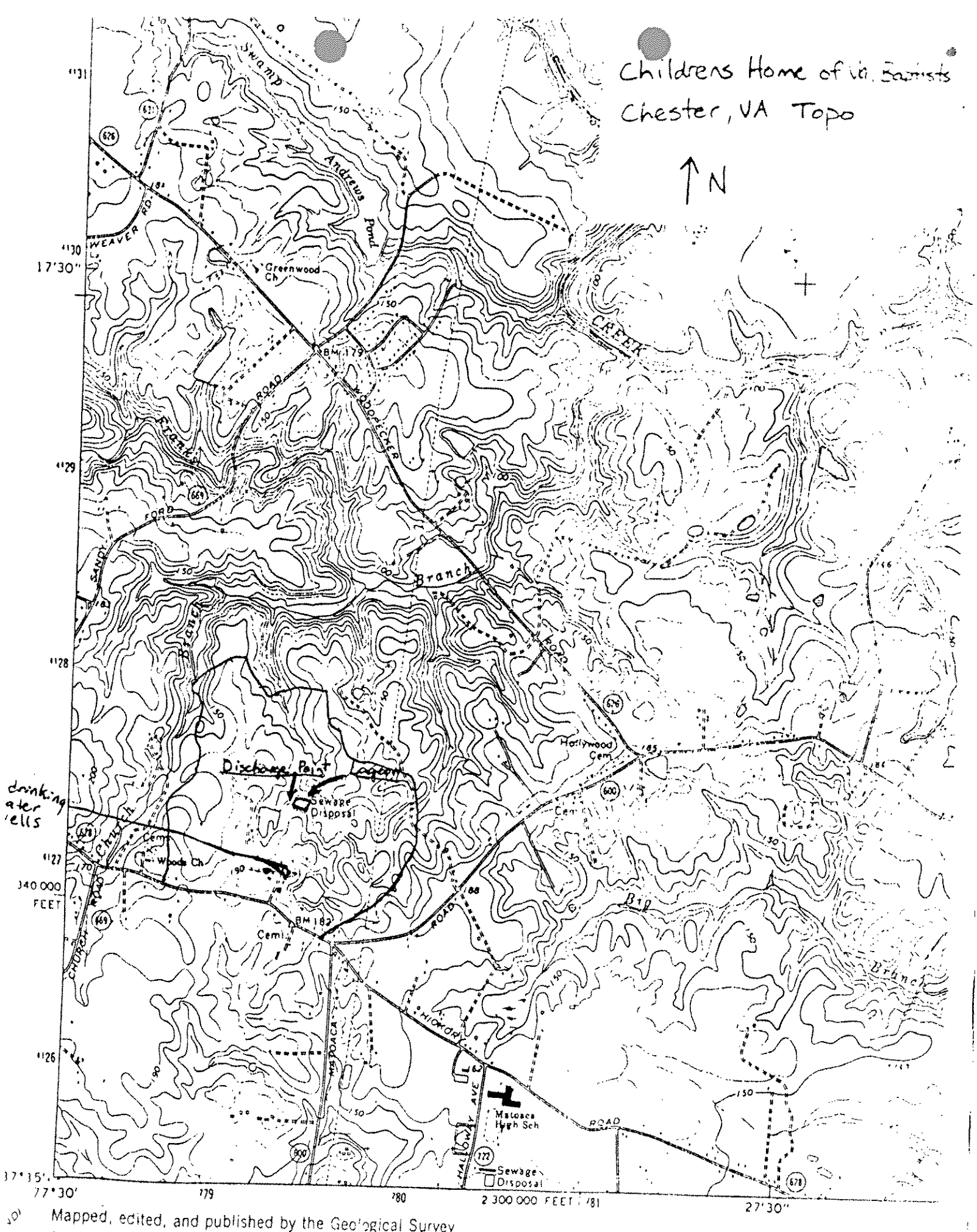

WATER-LEVEL MARKER
LADDER
BOARD
DIKE
WALK-WAY
TANK
TOP VIEW


WATER-LEVEL MARKERS
LADDER
10'
8'
6'
4'
2'
TANK
12'
10'
8'
6'
4'

FLOW DIAGRAM OF FACILITIES



Attachment 3 – Topographic Map



Mapped, edited, and published by the Geological Survey

Control by USGS and NOS/NOAA

Topography by planetable surveys 1941 Revised from aerial

Attachment 4 – October 7, 2008 Inspection Report

Dawes

COMMONWEALTH of VIRGINIA

DEPARTMENT OF ENVIRONMENTAL QUALITY
PIEDMONT REGIONAL OFFICE
1949 A Cox Road, Glen Allen, Virginia 23060
(804) 527-5020 Fax (804) 527-5106
www.deq.virginia.gov

L. Preston Bryant, Jr.
Secretary of Natural Resources

David K. Paylor
Director

Gerard Seeley, Jr.
Regional Director

October 15, 2008

Dr. Jean Cobbs
Children's Home of VA Baptists
6900 Hickory Road
Petersburg, VA 23803

RE: VA0027561—VPDES Wastewater Discharge Permit – Children's Home of VA Baptists Facility Inspection Report

Dear Dr. Cobbs:

Enclosed is your copy of the facility inspection report for the inspection conducted at the Children's Home located at 6900 Hickory Road, Petersburg, VA on October 7, 2008. Recommendations are listed on page two of the report. You need not respond to this letter unless you have further questions.

I would like to thank you for the time and courtesy extended to us during the inspection. It was a pleasure seeing you again. Should you have any questions about the report, please do not hesitate to call me at 804-527-5064 or Meredith Williams at 804-527-5017.

Sincerely,

Heather A. Horne

Heather A. Horne
Environmental Inspector

Attachments
cc: DEQ – OWCP

Virginia Department of Environmental Quality

RECON INSPECTION REPORT

FACILITY NAME: Children's Home of Virginia Baptists		**INSPECTION DATE:** 10/7/08	
		INSPECTOR H.Horne and M. Williams	
PERMIT No.: VA0027561		**REPORT DATE:** 10/10/08	
TYPE OF FACILITY: ☑ Municipal ☐ Major ☐ Industrial ☑ Minor ☐ Federal ☐ Small Minor ☐ HP ☐ LP		**TIME OF INSPECTION:**	1408 Arrival / 1512 Departure
		TOTAL TIME SPENT (including prep & travel)	8 Hours
PHOTOGRAPHS: ☑ Yes ☐ No		**UNANNOUNCED INSPECTION?** ☑ Yes ☐ No	
REVIEWED BY / Date: M Williams 10/15/08			
PRESENT DURING INSPECTION: Dr. Jean Cobbs and Dr. Anderson			

Jah 10.15.08

INSPECTION OVERVIEW AND CONDITION OF TREATMENT UNITS

The facility maintains a stabilization lagoon that receives wastewater by gravity flow from a Children's Home located at 6900 Hickory Road in Chesterfield County. On October 6 and October 7, 2008 DEQ water permit and enforcement staff received information that wastewater lagoon at this facility was having problems. The facility reported that the influent pipe appeared to be vandalized and was partially missing. The facility was also concerned because lagoon levels had increased and decreased rapidly in recent days and the facility was afraid that a natural spring may be flowing into the lagoon. Inspection staff were asked to investigate this report.

A similar report was investigated by inspectors on April 26, 2007. Under normal circumstances, influent enters in the middle portion of the lagoon; however, in April 2007 the PVC pipe that carries water to the center of the lagoon had become disconnected from the metal pipe at the edge of the lagoon. A new PVC influent pipe was installed in the lagoon in July 2008. The security fence surrounding the lagoon was removed during the influent pipe installation. Following the repairs, the end segments of the new pipe went missing. The facility hypothesized that since the fence was broken vandals had access to the lagoon and removed the end of the influent pipe.

On 10/7/08, inspectors examined the lagoon. The new PVC influent pipe is constructed out of ~6-8 inch sewer pipe. The pipe is supported by brick risers in the lagoon. The pipe was secured to the risers with plastic straps. Only two of the six plastic straps were present, but Dr. Cobbs reported all straps were present when the pipe was installed. The influent pipe is bowed and appears to be strained at the existing final segment. It appears wastewater is collecting in the low point of the bow. (See attached photographs.) The sewer pipe segments are not supported at the joints and the pipe was not resting at the appropriate position on all risers. Based on strap strain and pipe position, it appears the influent pipe has shifted (likely from soil settling following installation). This strain on the straps and joints cause inspectors to suspect the final end segment has fallen into the wastewater lagoon. Inspectors did not observe any signs of vandalism. Although the pipe end segment is missing, wastewater treatment does not appear to be affected. Inspectors recommended that Dr. Cobbs contact the contractors who installed the influent pipe for proper repair. Inspectors did not see evidence of a natural spring entering the lagoon. Dr. Cobbs stated the water level in the lagoon visually fluctuates daily. Freeboard at the time of inspection was >4 feet.

While onsite, inspectors viewed the discharge riser structure. The facility is gathering bids for the repair of this structure and the fence. Inspectors also reviewed the discharge point, including the new discharge pipe. The pipe is partially buried and a discharge was not apparent. A pool of gray water was downstream from the discharge pipe. The source of the gray water was not determined.

VA DEQ Recon Inspection Report

Permit #	VA0027561

EFFLUENT FIELD DATA:

Flow	0* MGD	**Dissolved Oxygen**	* mg/L	**TRC (Contact Tank)**	* mg/L
pH	* S.U.	**Temperature**	* °C	**TRC (Final Effluent)**	* mg/L

Was a Sampling Inspection conducted? ☐ Yes (see Sampling Inspection Report) ☑ No

*No discharge at the time of inspection

CONDITION OF OUTFALL AND EFFLUENT CHARACTERISTICS:

1. Type of outfall: ☑ Shore based ☐ Submerged Diffuser? ☐ Yes ☑ No
2. Are the outfall and supporting structures in good condition? ☑ Yes ☐ No
3. Final Effluent (evidence of following problems): ☐ Sludge bar ☐ Grease ☐ Turbid effluent ☐ Visible foam ☐ Unusual color ☐ Oil sheen
4. Is there a visible effluent plume in the receiving stream? ☐ Yes ☑ No
5. Receiving stream: ☑ No observed problems ☐ Indication of problems (explain below)

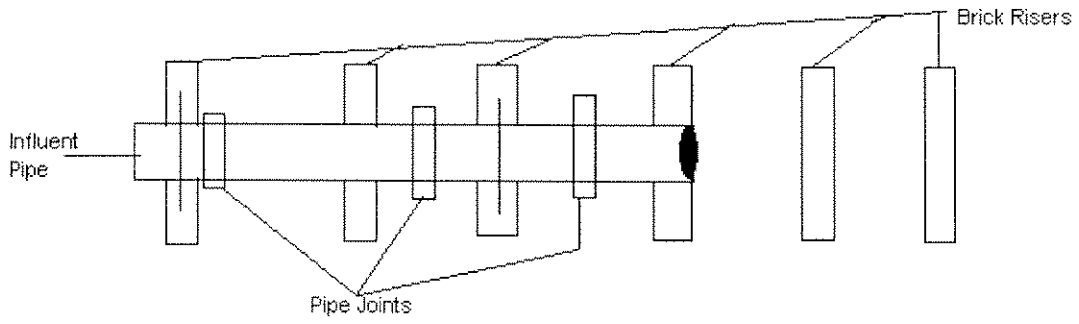
REQUIRED CORRECTIVE ACTIONS:

1. None.

NOTES and COMMENTS:

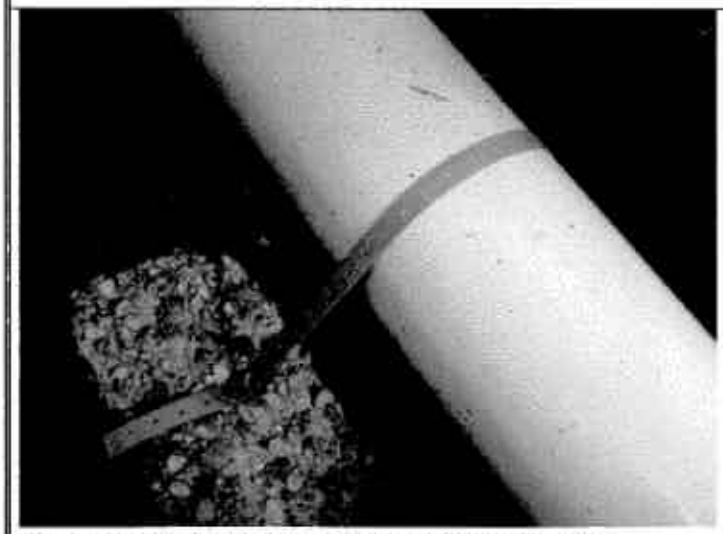
1. The facility contact reported noticeable fluctuation in lagoon levels daily. Due to the age and condition of the lagoon, groundwater intrusion is suspected.

Sketch of influent structure:

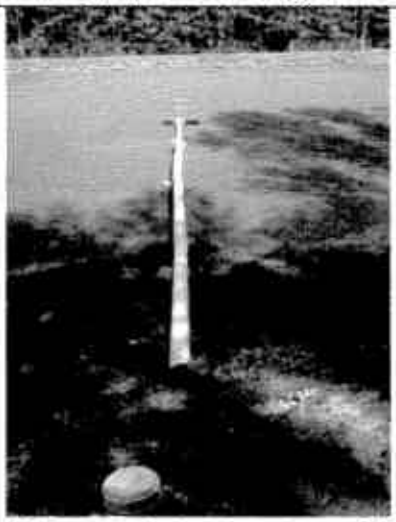


Photograph 1: Facility entrance

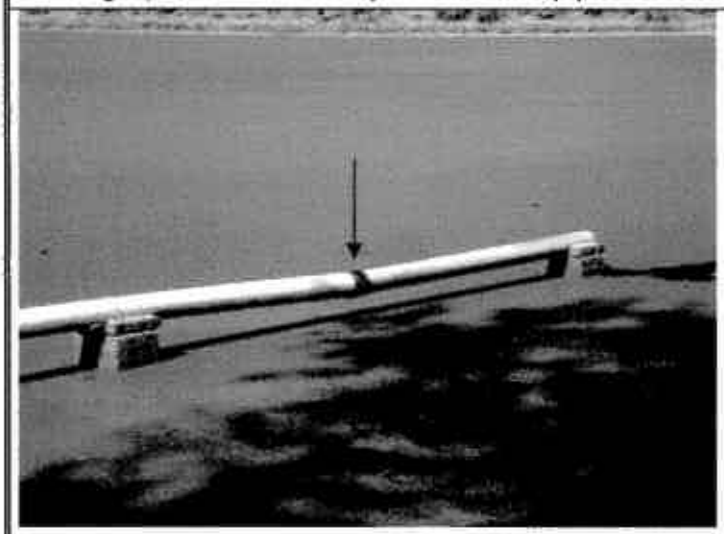
Photograph 2: Missing end segments



Photograph 3: Plastic straps on influent pipe



Photograph 4: Overview of influent pipe



Photograph 5: Sideview of influent pipe (note bowing at joint)

Photograph 6: Shift in pipe from second riser

Photograph 7: Discharge structure

Photograph 8: Discharge pipe

Photograph 9: Water down gradient from discharge pipe

Photograph 10: Overview of ponded water down gradient from discharge pipe

Attachment 5 – Permit Limits Development

MSTRANTI DATA SOURCE REPORT

VA0027561 –Children's Baptist Home of Virginia

Stream Information:	
Mean Hardness	Same as effluent as recommended by planning staff. See Flow Frequency Memo dated October 20, 2008 (Attachment 1).
90% Temperature	
90% Maximum pH	
10% Maximum pH	
Tier Designation	
Stream Flows:	
Mixing Information:	
Flow Analysis	100% Mix because all flow is assumed from effluent.
Effluent Information:	
Mean Hardness	BPJ. Effluent data not available. Used conservative assumption.
90% Temperature	Facility has not had a discharge, therefore no DMR data available. An average temperature of 28.1°C was reported in Form 2A Section A.12 and used in place of the 90th percentile. This temperature is representative of other lagoon temperatures in the same geographic region.
90% Maximum pH	Facility has not had a discharge, therefore no DMR data available. The maximum pH reported on the Form 2A Section A.12 was used in place of the 90th percentile since data are limited.
10% Maximum pH	
Discharge Flow	Design Flow as reported in Permit Application Form 2A.

FRESHWATER
WATER QUALITY CRITERIA / WASTELOAD ALLOCATION ANALYSIS

Facility Name: Children's Baptist Home of Virginia Permit No.: VA0027561

Receiving Stream: UT to Church Branch Version: OWP Guidance Memo 00-2011 (8/24/00)

Stream Information			Stream Flows			Mixing Information			Effluent Information		
Mean Hardness (as CaCO3) =	25	mg/L	1Q10 (Annual) =	0	MGD	Annual - 1Q10 Mix =	100	%	Mean Hardness (as CaCO3) =	25	mg/L
90% Temperature (Annual) =	28.1	deg C	7Q10 (Annual) =	0	MGD	- 7Q10 Mix =	100	%	90% Temp (Annual) =	28.1	deg C
90% Temperature (Wet season) =		deg C	30Q10 (Annual) =	0	MGD	- 30Q10 Mix =	100	%	90% Temp (Wet season) =		deg C
90% Maximum pH =	7.27	SU	1Q10 (Wet season) =	0	MGD	Wet Season - 1Q10 Mix =		%	90% Maximum pH =	7.27	SU
10% Maximum pH =		SU	30Q10 (Wet season)	0	MGD	- 30Q10 Mix =		%	10% Maximum pH =		SU
Tier Designation (1 or 2) =	1		30Q5 =	0	MGD				Discharge Flow =	0.01	MGD
Public Water Supply (PWS) Y/N? =	n		Harmonic Mean =	0	MGD						
Trout Present Y/N? =	n		Annual Average =	0	MGD						
Early Life Stages Present Y/N? =	y										

Parameter	Background	Water Quality Criteria				Wasteload Allocations				Antidegradation Baseline				Antidegradation Allocations				Most Limiting Allocations			
(ug/l unless noted)	Conc	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH
Acrolein	0	--	--	na	7.8E+02	--	--	na	7.8E+02	--	--	--	--	--	--	--	--	--	--	na	7.8E+02
Acrylonitrile [C]	0	--	--	na	6.6E+00	--	--	na	6.6E+00	--	--	--	--	--	--	--	--	--	--	na	6.6E+00
Aldrin [C]	0	3.0E+00	--	na	1.4E-03	3.0E+00	--	na	1.4E-03	--	--	--	--	--	--	--	--	3.0E+00	--	na	1.4E-03
Ammonia-N (mg/l) (Yearly)	0	2.72E+01	2.16E+00	na	--	2.7E+01	2.2E+00	na	--	--	--	--	--	--	--	--	--	2.7E+01	2.2E+00	na	--
Ammonia-N (mg/l) (High Flow)	0	2.72E+01	5.17E+00	na	--	2.7E+01	5.2E+00	na	--	--	--	--	--	--	--	--	--	2.7E+01	5.2E+00	na	--
Anthracene	0	--	--	na	1.1E+05	--	--	na	1.1E+05	--	--	--	--	--	--	--	--	--	--	na	1.1E+05
Antimony	0	--	--	na	4.3E+03	--	--	na	4.3E+03	--	--	--	--	--	--	--	--	--	--	na	4.3E+03
Arsenic	0	3.4E+02	1.5E+02	na	--	3.4E+02	1.5E+02	na	--	--	--	--	--	--	--	--	--	3.4E+02	1.5E+02	na	--
Barium	0	--	--	na	--	--	--	na	--	--	--	--	--	--	--	--	--	--	--	na	--
Benzene [C]	0	--	--	na	7.1E+02	--	--	na	7.1E+02	--	--	--	--	--	--	--	--	--	--	na	7.1E+02
Benzidine [C]	0	--	--	na	5.4E-03	--	--	na	5.4E-03	--	--	--	--	--	--	--	--	--	--	na	5.4E-03
Benzo (a) anthracene [C]	0	--	--	na	4.9E-01	--	--	na	4.9E-01	--	--	--	--	--	--	--	--	--	--	na	4.9E-01
Benzo (b) fluoranthene [C]	0	--	--	na	4.9E-01	--	--	na	4.9E-01	--	--	--	--	--	--	--	--	--	--	na	4.9E-01
Benzo (k) fluoranthene [C]	0	--	--	na	4.9E-01	--	--	na	4.9E-01	--	--	--	--	--	--	--	--	--	--	na	4.9E-01
Benzo (a) pyrene [C]	0	--	--	na	4.9E-01	--	--	na	4.9E-01	--	--	--	--	--	--	--	--	--	--	na	4.9E-01
Bis2-Chloroethyl Ether	0	--	--	na	1.4E+01	--	--	na	1.4E+01	--	--	--	--	--	--	--	--	--	--	na	1.4E+01
Bis2-Chloroisopropyl Ether	0	--	--	na	1.7E+05	--	--	na	1.7E+05	--	--	--	--	--	--	--	--	--	--	na	1.7E+05
Bromoform [C]	0	--	--	na	3.6E+03	--	--	na	3.6E+03	--	--	--	--	--	--	--	--	--	--	na	3.6E+03
Butylbenzylphthalate	0	--	--	na	5.2E+03	--	--	na	5.2E+03	--	--	--	--	--	--	--	--	--	--	na	5.2E+03
Cadmium	0	8.2E-01	3.8E-01	na	--	8.2E-01	3.8E-01	na	--	--	--	--	--	--	--	--	--	8.2E-01	3.8E-01	na	--
Carbon Tetrachloride [C]	0	--	--	na	4.4E+01	--	--	na	4.4E+01	--	--	--	--	--	--	--	--	--	--	na	4.4E+01
Chlordane [C]	0	2.4E+00	4.3E-03	na	2.2E-02	2.4E+00	4.3E-03	na	2.2E-02	--	--	--	--	--	--	--	--	2.4E+00	4.3E-03	na	2.2E-02
Chloride	0	8.6E+05	2.3E+05	na	--	8.6E+05	2.3E+05	na	--	--	--	--	--	--	--	--	--	8.6E+05	2.3E+05	na	--
TRC	0	1.9E+01	1.1E+01	na	--	1.9E+01	1.1E+01	na	--	--	--	--	--	--	--	--	--	1.9E+01	1.1E+01	na	--
Chlorobenzene	0	--	--	na	2.1E+04	--	--	na	2.1E+04	--	--	--	--	--	--	--	--	--	--	na	2.1E+04

Parameter	Background	Water Quality Criteria				Wasteload Allocations				Antidegradation Baseline				Antidegradation Allocations				Most Limiting Allocations			
(ug/l unless noted)	Conc	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH
Chlorodibromomethane [C]	0	--	--	na	3.4E+02	--	--	na	3.4E+02	--	--	--	--	--	--	--	--	--	--	na	3.4E+02
Chloroform [C]	0	--	--	na	2.9E+04	--	--	na	2.9E+04	--	--	--	--	--	--	--	--	--	--	na	2.9E+04
2-Chloronaphthalene	0	--	--	na	4.3E+03	--	--	na	4.3E+03	--	--	--	--	--	--	--	--	--	--	na	4.3E+03
2-Chlorophenol	0	--	--	na	4.0E+02	--	--	na	4.0E+02	--	--	--	--	--	--	--	--	--	--	na	4.0E+02
Chlorpyrifos	0	8.3E-02	4.1E-02	na	--	8.3E-02	4.1E-02	na	--	--	--	--	--	--	--	--	--	8.3E-02	4.1E-02	na	--
Chromium III	0	1.8E+02	2.4E+01	na	--	1.8E+02	2.4E+01	na	--	--	--	--	--	--	--	--	--	1.8E+02	2.4E+01	na	--
Chromium VI	0	1.6E+01	1.1E+01	na	--	1.6E+01	1.1E+01	na	--	--	--	--	--	--	--	--	--	1.6E+01	1.1E+01	na	--
Chromium, Total	0	-	--	na	--	--	--	na	--	--	--	--	--	--	--	--	--	--	--	na	--
Chrysene [C]	0	--	--	na	4.9E-01	--	--	na	4.9E-01	--	--	--	--	--	--	--	--	--	--	na	4.9E-01
Copper	0	3.6E+00	2.7E+00	na	--	3.6E+00	2.7E+00	na	--	--	--	--	--	--	--	--	--	3.6E+00	2.7E+00	na	--
Cyanide	0	2.2E+01	5.2E+00	na	2.2E+05	2.2E+01	5.2E+00	na	2.2E+05	--	--	--	--	--	--	--	--	2.2E+01	5.2E+00	na	2.2E+05
DDD [C]	0	--	--	na	8.4E-03	--	--	na	8.4E-03	--	--	--	--	-	-	--	-	--	--	na	8.4E-03
DDE [C]	0	--	--	na	5.9E-03	--	--	na	5.9E-03	--	--	--	--	--	--	--	--	--	--	na	5.9E-03
DDT [C]	0	1.1E+00	1.0E-03	na	5.9E-03	1.1E+00	1.0E-03	na	5.9E-03	--	--	--	--	-	--	--	--	1.1E+00	1.0E-03	na	5.9E-03
Demeton	0	--	1.0E-01	na	--	--	1.0E-01	na	--	--	--	--	--	--	--	-	--	--	1.0E-01	na	--
Dibenz(a,h)anthracene [C]	0	--	--	na	4.9E-01	--	--	na	4.9E-01	--	--	--	--	--	--	--	--	--	--	na	4.9E-01
Dibutyl phthalate	0	--	--	na	1.2E+04	--	--	na	1.2E+04	--	--	--	--	--	--	--	--	--	--	na	1.2E+04
Dichloromethane (Methylene Chloride) [C]	0	--	--	na	1.6E+04	--	--	na	1.6E+04	--	--	--	--	--	--	--	-	--	--	na	1.6E+04
1,2-Dichlorobenzene	0	--	--	na	1.7E+04	--	--	na	1.7E+04	--	--	--	--	--	--	--	--	--	--	na	1.7E+04
1,3-Dichlorobenzene	0	--	--	na	2.6E+03	--	--	na	2.6E+03	--	--	--	--	--	--	--	--	--	--	na	2.6E+03
1,4-Dichlorobenzene	0	--	--	na	2.6E+03	--	--	na	2.6E+03	--	--	--	--	--	--	--	--	--	--	na	2.6E+03
3,3-Dichlorobenzidine [C]	0	--	--	na	7.7E-01	--	--	na	7.7E-01	--	--	--	--	--	--	--	--	--	--	na	7.7E-01
Dichlorobromomethane [C]	0	--	--	na	4.6E+02	--	--	na	4.6E+02	--	--	--	--	--	--	--	--	--	--	na	4.6E+02
1,2-Dichloroethane [C]	0	--	--	na	9.9E+02	--	--	na	9.9E+02	--	--	--	--	--	-	--		--	--	na	9.9E+02
1,1-Dichloroethylene	0	--	-	na	1.7E+04	--	--	na	1.7E+04	--	--	--	--	--	--	--	--	--	--	na	1.7E+04
1,2-trans-dichloroethylene	0	--	--	na	1.4E+05	--	--	na	1.4E+05	--	--	--	--	--	--	--	--	--	--	na	1.4E+05
2,4-Dichlorophenol	0	--	--	na	7.9E+02	--	--	na	7.9E+02	--	--	--	--	--	--	--	--	--	--	na	7.9E+02
2,4-Dichlorophenoxy acetic acid (2,4-D)	0	--	--	na	--	--	--	na	--	--	--	--	--	--	--	--	--	--	--	na	--
1,2-Dichloropropane [C]	0	--	--	na	3.9E+02	--	--	na	3.9E+02	--	--	--	--	--	--	--	--	--	--	na	3.9E+02
1,3-Dichloropropene	0	--	--	na	1.7E+03	--	--	na	1.7E+03	--	--	--	--	--	--	--	--	--	--	na	1.7E+03
Dieldrin [C]	0	2.4E-01	5.6E-02	na	1.4E-03	2.4E-01	5.6E-02	na	1.4E-03	--	--	--	--	--	--	--	--	2.4E-01	5.6E-02	na	1.4E-03
Diethyl Phthalate	0	--	--	na	1.2E+05	--	--	na	1.2E+05	--	--	--	--	--	--	--	--	--	--	na	1.2E+05
Di-2-Ethythexyl Phthalate [C]	0	--	--	na	5.9E+01	--	--	na	5.9E+01	--	--	--	--	--	--	--	--	--	--	na	5.9E+01
2,4-Dimethylphenol	0	--	--	na	2.3E+03	--	--	na	2.3E+03	--	--	--	--	--	--	--	--	--	--	na	2.3E+03
Dimethyl Phthalate	0	--	--	na	2.9E+06	--	--	na	2.9E+06	--	--	--	--	--	--	--	--	--	--	na	2.9E+06
Di-n-Butyl Phthalate	0	--	--	na	1.2E+04	--	--	na	1.2E+04	--	--	--	--	--	--	--	-	--	--	na	1.2E+04
2,4 Dinitrophenol	0	--	--	na	1.4E+04	--	--	na	1.4E+04	--	--	--	--	--	--	--	--	--	--	na	1.4E+04
2-Methyl-4,6-Dinitrophenol	0	--	--	na	7.65E+02	--	--	na	7.7E+02	--	--	--	--	--	--	--	--	--	--	na	7.7E+02
2,4-Dinitrotoluene [C]	0	--	--	na	9.1E+01	--	--	na	9.1E+01	--	--	--	--	--	--	--	--	--	--	na	9.1E+01
Dioxin (2,3,7,8-tetrachlorodibenzo-p-dioxin) (ppq)	0	--	--	na	1.2E-06	--	--	na	na	--	--	--	--	--	--	--	-	--	--	na	na
1,2-Diphenylhydrazine [C]	0	--	--	na	5.4E+00	--	--	na	5.4E+00	--	--	--	--	--	--	--	-	--	--	na	5.4E+00
Alpha-Endosulfan	0	2.2E-01	5.6E-02	na	2.4E+02	2.2E-01	5.6E-02	na	2.4E+02	--	--	--	--	--	--	--	--	2.2E-01	5.6E-02	na	2.4E+02
Beta-Endosulfan	0	2.2E-01	5.6E-02	na	2.4E+02	2.2E-01	5.6E-02	na	2.4E+02	--	--	--	--	--	--	--	--	2.2E-01	5.6E-02	na	2.4E+02
Endosulfan Sulfate	0	--	--	na	2.4E+02	--	--	na	2.4E+02	--	--	--	--	--	--	--	--	--	--	na	2.4E+02
Endrin	0	8.6E-02	3.6E-02	na	8.1E-01	8.6E-02	3.6E-02	na	8.1E-01	--	--	--	--	--	--	--	--	8.6E-02	3.6E-02	na	8.1E-01
Endrin Aldehyde	0	--	--	na	8.1E-01	--	--	na	8.1E-01	--	--	--	--	--	--	--	--	--	--	na	8.1E-01

Parameter (ug/l unless noted)	Background Conc	Water Quality Criteria				Wasteload Allocations				Antidegradation Baseline				Antidegradation Allocations				Most Limiting Allocations			
		Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH
Ethylbenzene	0	--	--	na	2.9E+04	--	--	na	2.9E+04	--	--	--	--	--	--	--	--	--	--	na	2.9E+04
Fluoranthene	0	--	--	na	3.7E+02	--	--	na	3.7E+02	--	--	--	--	--	--	--	--	--	--	na	3.7E+02
Fluorene	0	--	--	na	1.4E+04	--	--	na	1.4E+04	--	--	--	--	--	--	--	--	--	--	na	1.4E+04
Foaming Agents	0	--	--	na	--	--	--	na	--	--	--	--	--	--	--	--	--	--	--	na	--
Guthion	0	--	1.0E-02	na	--	--	1.0E-02	na	--	--	--	--	--	--	--	--	--	--	1.0E-02	na	--
Heptachlor [C]	0	5.2E-01	3.8E-03	na	2.1E-03	5.2E-01	3.8E-03	na	2.1E-03	--	--	--	--	--	--	--	--	5.2E-01	3.8E-03	na	2.1E-03
Heptachlor Epoxide [C]	0	5.2E-01	3.8E-03	na	1.1E-03	5.2E-01	3.8E-03	na	1.1E-03	--	--	--	--	--	--	--	--	5.2E-01	3.8E-03	na	1.1E-03
Hexachlorobenzene [C]	0	--	--	na	7.7E-03	--	--	na	7.7E-03	--	--	--	--	--	--	--	--	--	--	na	7.7E-03
Hexachlorobutadiene [C]	0	--	--	na	5.0E+02	--	--	na	5.0E+02	--	--	--	--	--	--	--	--	--	--	na	5.0E+02
Hexachlorocyclohexane Alpha-BHC [C]	0	--	--	na	1.3E-01	--	--	na	1.3E-01	--	--	--	--	--	--	--	--	--	--	na	1.3E-01
Hexachlorocyclohexane Beta-BHC [C]	0	--	--	na	4.6E-01	--	--	na	4.6E-01	--	--	--	--	--	--	--	--	--	--	na	4.6E-01
Hexachlorocyclohexane Gamma-BHC [C] (Lindane)	0	9.5E-01	na	na	6.3E-01	9.5E-01	--	na	6.3E-01	--	--	--	--	--	--	--	--	9.5E-01	--	na	6.3E-01
Hexachlorocyclopentadiene	0	--	--	na	1.7E+04	--	--	na	1.7E+04	--	--	--	--	--	--	--	--	--	--	na	1.7E+04
Hexachloroethane [C]	0	--	--	na	8.9E+01	--	--	na	8.9E+01	--	--	--	--	--	--	--	--	--	--	na	8.9E+01
Hydrogen Sulfide	0	--	2.0E+00	na	--	--	2.0E+00	na	--	--	--	--	--	--	--	--	--	--	2.0E+00	na	--
Indeno (1,2,3-cd) pyrene [C]	0	--	--	na	4.9E-01	--	--	na	4.9E-01	--	--	--	--	--	--	--	--	--	--	na	4.9E-01
Iron	0	--	--	na	--	--	--	na	--	--	--	--	--	--	--	--	--	--	--	na	--
Isophorone [C]	0	--	--	na	2.6E+04	--	--	na	2.6E+04	--	--	--	--	--	--	--	--	--	--	na	2.6E+04
Kepone	0	--	0.0E+00	na	--	--	0.0E+00	na	--	--	--	--	--	--	--	--	--	--	0.0E+00	na	--
Lead	0	2.0E+01	2.3E+00	na	--	2.0E+01	2.3E+00	na	--	--	--	--	--	--	--	--	--	2.0E+01	2.3E+00	na	--
Malathion	0	--	1.0E-01	na	--	--	1.0E-01	na	--	--	--	--	--	--	--	--	--	--	1.0E-01	na	--
Manganese	0	--	--	na	--	--	--	na	--	--	--	--	--	--	--	--	--	--	--	na	--
Mercury	0	1.4E+00	7.7E-01	na	5.1E-02	1.4E+00	7.7E-01	na	5.1E-02	--	--	--	--	--	--	--	--	1.4E+00	7.7E-01	na	5.1E-02
Methyl Bromide	0	--	--	na	4.0E+03	--	--	na	4.0E+03	--	--	--	--	--	--	--	--	--	--	na	4.0E+03
Methoxychlor	0	--	3.0E-02	na	--	--	3.0E-02	na	--	--	--	--	--	--	--	--	--	--	3.0E-02	na	--
Mirex	0	--	0.0E+00	na	--	--	0.0E+00	na	--	--	--	--	--	--	--	--	--	--	0.0E+00	na	--
Monochlorobenzene	0	--	--	na	2.1E+04	--	--	na	2.1E+04	--	--	--	--	--	--	--	--	--	--	na	2.1E+04
Nickel	0	5.6E+01	6.3E+00	na	4.6E+03	5.6E+01	6.3E+00	na	4.6E+03	--	--	--	--	--	--	--	--	5.6E+01	6.3E+00	na	4.6E+03
Nitrate (as N)	0	--	--	na	--	--	--	na	--	--	--	--	--	--	--	--	--	--	--	na	--
Nitrobenzene	0	--	--	na	1.9E+03	--	--	na	1.9E+03	--	--	--	--	--	--	--	--	--	--	na	1.9E+03
N-Nitrosodimethylamine [C]	0	--	--	na	8.1E+01	--	--	na	8.1E+01	--	--	--	--	--	--	--	--	--	--	na	8.1E+01
N-Nitrosodiphenylamine [C]	0	--	--	na	1.6E+02	--	--	na	1.6E+02	--	--	--	--	--	--	--	--	--	--	na	1.6E+02
N-Nitrosodi-n-propylamine [C]	0	--	--	na	1.4E+01	--	--	na	1.4E+01	--	--	--	--	--	--	--	--	--	--	na	1.4E+01
Parathion	0	6.5E-02	1.3E-02	na	--	6.5E-02	1.3E-02	na	--	--	--	--	--	--	--	--	--	6.5E-02	1.3E-02	na	--
PCB-1016	0	--	1.4E-02	na	--	--	1.4E-02	na	--	--	--	--	--	--	--	--	--	--	1.4E-02	na	--
PCB-1221	0	--	1.4E-02	na	--	--	1.4E-02	na	--	--	--	--	--	--	--	--	--	--	1.4E-02	na	--
PCB-1232	0	--	1.4E-02	na	--	--	1.4E-02	na	--	--	--	--	--	--	--	--	--	--	1.4E-02	na	--
PCB-1242	0	--	1.4E-02	na	--	--	1.4E-02	na	--	--	--	--	--	--	--	--	--	--	1.4E-02	na	--
PCB-1248	0	--	1.4E-02	na	--	--	1.4E-02	na	--	--	--	--	--	--	--	--	--	--	1.4E-02	na	--
PCB-1254	0	--	1.4E-02	na	--	--	1.4E-02	na	--	--	--	--	--	--	--	--	--	--	1.4E-02	na	--
PCB-1260	0	--	1.4E-02	na	--	--	1.4E-02	na	--	--	--	--	--	--	--	--	--	--	1.4E-02	na	--
PCB Total [C]	0	--	--	na	1.7E-03	--	--	na	1.7E-03	--	--	--	--	--	--	--	--	--	--	na	1.7E-03

Parameter	Background	Water Quality Criteria				Wasteload Allocations				Antidegradation Baseline				Antidegradation Allocations				Most Limiting Allocations			
(ug/l unless noted)	Conc	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH
Pentachlorophenol [C]	0	7 7E-03	5 9E-03	na	8 2E+01	7 7E-03	5.9E-03	na	8.2E+01	--	--	--	--	--	--	--	--	7.7E-03	5.9E-03	na	8.2E+01
Phenol	0	--	--	na	4 6E+06	--	--	na	4 6E+06	--	--	--	--	--	--	--	--	--	--	na	4.6E+06
Pyrene	0	--	--	na	1 1E+04	--	--	na	1 1E+04	--	--	--	--	--	--	--	--	--	--	na	1.1E+04
Radionuclides (pCi/l except Beta/Photon)	0	--	--	na	--	--	--	na	--	--	--	--	--	--	--	--	--	--	--	na	--
Gross Alpha Activity	0	--	--	na	1 5E+01	--	--	na	1 5E+01	--	--	--	--	--	--	--	--	--	--	na	1.5E+01
Beta and Photon Activity (mrem/yr)	0	--	--	na	4 0E+00	--	--	na	4 0E+00	--	--	--	--	--	--	--	--	--	--	na	4.0E+00
Strontium-90	0	--	--	na	8 0E+00	--	--	na	8 0E+00	--	--	--	--	--	--	--	--	--	--	na	8.0E+00
Tritium	0	--	--	na	2 0E+04	--	--	na	2 0E+04	--	--	--	--	--	--	--	--	--	--	na	2.0E+04
Selenium	0	2 0E+01	5.0E+00	na	1 1E+04	2.0E+01	5 0E+00	na	1 1E+04	--	--	--	--	--	--	--	--	2.0E+01	5.0E+00	na	1.1E+04
Silver	0	3 2E-01	--	na	--	3 2E-01	--	na	--	--	--	--	--	--	--	--	--	3.2E-01	--	na	--
Sulfate	0	--	--	na	--	--	--	na	--	--	--	--	--	--	--	--	--	--	--	na	--
1 1,2,2-Tetrachloroethane [C]	0	--	--	na	1 1E+02	--	--	na	1 1E+02	--	--	--	--	--	--	--	--	--	--	na	1.1E+02
Tetrachloroethylene [C]	0	--	--	na	8 9E+01	--	--	na	8 9E+01	--	--	--	--	--	--	--	--	--	--	na	8.9E+01
Thallium	0	--	--	na	6 3E+00	--	--	na	6 3E+00	--	--	--	--	--	--	--	--	--	--	na	6.3E+00
Toluene	0	--	--	na	2 0E+05	--	--	na	2 0E+05	--	--	--	--	--	--	--	--	--	--	na	2.0E+05
Total dissolved solids	0	--	--	na	--	--	--	na	--	--	--	--	--	--	--	--	--	--	--	na	--
Toxaphene [C]	0	7 3E-01	2 0E-04	na	7 5E-03	7 3E-01	2 0E-04	na	7 5E-03	--	--	--	--	--	--	--	--	7.3E-01	2.0E-04	na	7.5E-03
Tributyltin	0	4 6E-01	6 3E-02	na	--	4 6E-01	6.3E-02	na	--	--	--	--	--	--	--	--	--	4.6E-01	6.3E-02	na	--
1,2,4-Trichlorobenzene	0	--	--	na	9 4E+02	--	--	na	9 4E+02	--	--	--	--	--	--	--	--	--	--	na	9.4E+02
1 1,2-Trichloroethane [C]	0	--	--	na	4 2E+02	--	--	na	4.2E+02	--	--	--	--	--	--	--	--	--	--	na	4.2E+02
Trichloroethylene [C]	0	--	--	na	8 1E+02	--	--	na	8 1E+02	--	--	--	--	--	--	--	--	--	--	na	8.1E+02
2,4,6-Trichlorophenol [C]	0	--	--	na	6 5E+01	--	--	na	6 5E+01	--	--	--	--	--	--	--	--	--	--	na	6.5E+01
2-(2,4,5-Trichlorophenoxy) propionic acid (Silvex)	0	--	--	na	--	--	--	na	--	--	--	--	--	--	--	--	--	--	--	na	--
Vinyl Chloride [C]	0	--	--	na	6 1E+01	--	--	na	6 1E+01	--	--	--	--	--	--	--	--	--	--	na	6.1E+01
Zinc	0	3 6E+01	3 6E+01	na	6.9E+04	3 6E+01	3 6E+01	na	6 9E+04	--	--	--	--	--	--	--	--	3.6E+01	3.6E+01	na	6.9E+04

Notes

1 All concentrations expressed as micrograms/liter (ug/l), unless noted otherwise

2 Discharge flow is highest monthly average or Form 2C maximum for Industries and design flow for Municipals

3 Metals measured as Dissolved, unless specified otherwise

4 "C" indicates a carcinogenic parameter

5 Regular WLAs are mass balances (minus background concentration) using the % of stream flow entered above under Mixing Information
Antidegradation WLAs are based upon a complete mix

6 Antideg Baseline = (0 25(WQC - background conc) + background conc) for acute and chronic
= (0 1(WQC - background conc) + background conc) for human health

7 WLAs established at the following stream flows 1Q10 for Acute, 30Q10 for Chronic Ammonia, 7Q10 for Other Chronic, 30Q5 for Non-carcinogens, Harmonic Mean for Carcinogens, and Annual Average for Dioxin Mixing ratios may be substituted for stream flows where appropriate

Metal	Target Value (SSTV)
Antimony	4 3E+03
Arsenic	9 0E+01
Barium	na
Cadmium	2 3E-01
Chromium III	1 4E+01
Chromium VI	6 4E+00
Copper	1 5E+00
Iron	na
Lead	1 4E+00
Manganese	na
Mercury	5 1E-02
Nickel	3 8E+00
Selenium	3 0E+00
Silver	1 3E-01
Zinc	1 4E+01

Note do not use QL's lower than the minimum QL's provided in agency guidance

Chemical = Ammonia
Chronic averaging period = 30
WLAa = 27
WLAc = 2.2
Q.L. = 0.2
# samples/mo. = 1
# samples/wk. = 1

Summary of Statistics:

observations = 1
Expected Value = 9
Variance = 29.16
C.V. = 0.6
97th percentile daily values = 21.9007
97th percentile 4 day average = 14.9741
97th percentile 30 day average= 10.8544
< Q.L. = 0
Model used = BPJ Assumptions, type 2 data

A limit is needed based on Chronic Toxicity
Maximum Daily Limit = 4.43887420551588
Average Weekly Limit = 4.43887420551589
Average Monthly Limit = 4.43887420551589

The data are:

9.00

Chemical = TRC
Chronic averaging period = 4
WLAa = 0.019
WLAc = 0.011
Q.L. = 0.1
# samples/mo. = 30
# samples/wk. = 7

Summary of Statistics:

observations = 1
Expected Value = 20
Variance = 144
C.V. = 0.6
97th percentile daily values = 48.6683
97th percentile 4 day average = 33.2758
97th percentile 30 day average= 24.1210
< Q.L. = 0
Model used = BPJ Assumptions, type 2 data

A limit is needed based on Chronic Toxicity
Maximum Daily Limit = 1.60883226245855E-02
Average Weekly limit = 9.8252545713861E-03
Average Monthly Limit = 7.9737131838758E-03

The data are:

20

Attachment 6 – Ground Water Monitoring Evaluation

Groundwater Monitoring Data Analysis

Background

A groundwater monitoring plan for the Children's Baptist Home of Virginia was approved December 28, 1994. The plan requires monitoring for the following parameters annually from Wells 1, 2, and 3: pH, specific conductance, ammonia, nitrate, TDS, chloride, TKN, phosphorus, TOC, and fecal coliform. Review of the groundwater monitoring data during the reissuance of the 2003 permit indicated potential groundwater contamination from the stabilization lagoon. The 2003 permit required the facility to submit a corrective action plan for possible groundwater contamination. A CAP submitted on July 24, 2006 was approved by DEQ in February 2007 and proposed continued monitoring in conjunction with a preliminary environmental risk assessment. The risk assessment indicated that no ground water supply wells are located down gradient of the lagoon and the nearest intermittent stream is approximately 900 feet down gradient.

Normality of data sets reported from 1995 through 2008 was tested using the Kolmorogov-Smirnov Goodness of Fit Test for Continuous Data (at a 5% Level of Significance). In most circumstances only the last five years of groundwater data is reviewed, however, since this facility is only required to monitor groundwater once per year, staff believed it to be acceptable to review all data to be able to perform the appropriate statistical analyses. The Student's T-test was used to determine whether or not there was a significant difference between the identified up-gradient and down gradient wells for each parameter where the data was normally distributed. For those parameters where the data was not normally distributed, a non-parametric test was used to determine if the non-normal data demonstrated a significant difference in up-gradient and down gradient data. The normal (t-test) and non-normal test results are below. Well MW-1 is the background monitoring well. The data were also reviewed for exceedances of the Groundwater Standards for the Piedmont and Blue Ridge Providence found in 9 VAC 25-280-50. Fecal coliform data was not analyzed for significant differences from up gradient to down gradient wells.

Data Evaluation

Summary of Significance Tests

	Well 2	Well 3
pH		
Specific Conductance	X	X
Ammonia	X	X
Nitrate		
TDS	X	X
Chlorides	X	X
TKN	X	X
Total Phosphorus	X	
TOC	X	

Notes:
(1) "X" signifies a significant difference between the up gradient and down gradient well was observed.
(2) Data that was reported as <QL was analyzed at the QL concentration

Results

pH: The analysis indicates that there is no significant increase over background at any of the monitoring wells. However, on several occasions the groundwater monitoring results were found

to exceed the groundwater standard range of 5.5-8.5 S.U. at the up gradient and down gradient wells. Specifically, results were found outside the standard range as follows: Well 1: 9 times, Well 2: 6 times, and Well 3: 7 times.

Specific Conductance: The analysis indicates that there is a significant increase over background levels at Well 2 and 3. While there is no criteria or standard for specific conductance, a significant difference can be an indicator that the lagoon is impacting groundwater.

Ammonia: The analysis indicates that there is significant increase over background concentrations at Wells 2 and 3. In addition, the groundwater standard for ammonia is 0.025 mg/L. The detection limit for ammonia was reported as 0.1 mg/L and most recently 0.2 mg/L. However, monitoring demonstrated exceedance of the standards on several occasions as follows: Well 1: 6 times, Well 2: 13 times, and Well 3: 5 times.

Nitrate: The analysis indicates that there is no significant increase over background concentrations at any of the monitoring wells. The data demonstrates that the groundwater standard of 5.0 mg/L for nitrate was not exceeded.

TDS: The analysis indicates a significant increase above background concentrations for TDS in Wells 2 and 3. While there is no groundwater standard for TDS, there is a Groundwater Criterion used for determining potential contamination of 250 mg/L. There are no results that exceed the criterion.

Chlorides: The analysis indicates that there is significant increase over background concentrations at Wells 2 and 3. There is no groundwater standard for chlorides but there is a Groundwater Criterion of 25 mg/l in the Piedmont Physiographic province. There are no data points that exceed the criterion.

TKN: There is no groundwater standard or criterion for TKN, but there are standards for nitrate, nitrite, and ammonia which collectively are identified as TKN. The analysis identified a significant difference in concentration between up gradient and down gradient wells which may indicate potential groundwater contamination from the lagoon.

Total Phosphorus: The analysis indicates that there is significant increase over background concentrations at Well 2 for phosphorous.

TOC: The analysis indicates that there is significant increase over background at Well 2.

Fecal Coliform: Review of groundwater monitoring data indicates that in most cases fecal coliform is considered absent from the sampling because it is less 1. There are only two instances, in 1992, Well 2 results indicated a higher presence of fecal coliform with counts equaling 6 and 28 N per 100 mL.

Conclusion

For both Wells 2 and 3, significant differences between the up gradient and down gradient well pollutant concentrations were observed in the data analysis as identified above. Also, there are several instances in which the groundwater monitoring results exceeded the groundwater monitoring standards for the Piedmont and Blue Ridge Providence found in 9 VAC 20-280-50.

A corrective action plan is not being required as part of the permit since only one set of data has been collected and submitted since approval of the corrective action plan in February 2007. Groundwater data will be continued to be reviewed by staff during the term of the permit to determine if the additional items are required as part of the corrective action plan.

VA0027561 Children's Baptist Home of Virginia Groundwater Data

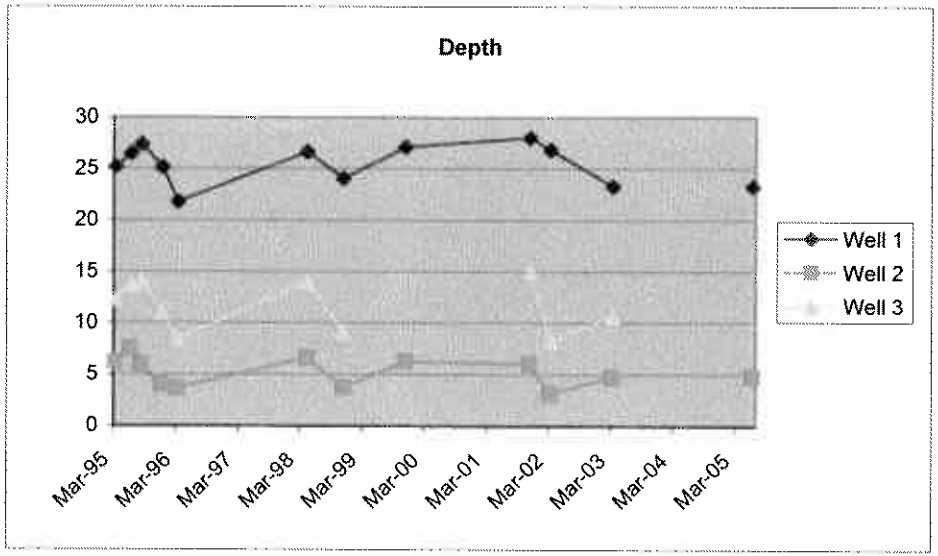
	Depth			pH			Spec Conductance			Ammonia		
Date	Well 1	Well 2	Well 3	Well 1	Well 2	Well 3	Well 1	Well 2	Well 3	Well 1	Well 2	Well 3
3/21/1995				5	5	5.5	42.6	81.7	0.31	0.12	0.1	0.62
6/20/1995	25.21	6.2	12.31	4.9	5.3	5.2	28	113	105	<0.1	<0.1	<0.1
8/28/1995	26.5	7.52	13.58	4.3	5.1	5	28	121	109	0.16	0.56	<0.10
12/4/1995	27.42	5.92	14.1	4.8	5.5	5.2	27	147	106	<0.1	0.34	<0.10
3/12/1996	25.18	4	10.9	4.8	5.4	4.9	31	114	59	0.18	0.32	<0.10
4/28/1998	21.79	3.65	8.37	4.69	5.22	4.71	27.6	104.9	59.9	<0.10	0.26	0.21
11/17/1998	26.62	6.55	13.9	4.98	5.18	5.28	23.8	124.5	133	0.16	0.52	0.34
11/9/1999	24.03	3.71	9.12	5.94	5.85	5.81	30.6	144.7	61.5	<0.10	0.46	<0.10
11/19/2001	27.09	6.18		6	5.94		27.9	188.8		0.15	0.7	
3/19/2002	28.01	5.97	15.01	6.04	5.97	5.96	26.9	180.9	61.8	<0.10	0.36	0.13
3/3/2003	26.82	3.09	8.24	6.05	6.01	5.96	29.4	162.5	63.1	<0.10	0.51	<0.10
6/15/2004	23.31	4.72	10.64	6.05	6.03	5.97	20	192	115	0.23	0.74	<0.2
6/1/2005				4.66	5.52	5.24	21	183	140	<0.20	0.85	0.31
6/5/2007	23.29	4.81		5.08	5.95		21	160		<0.20	1	

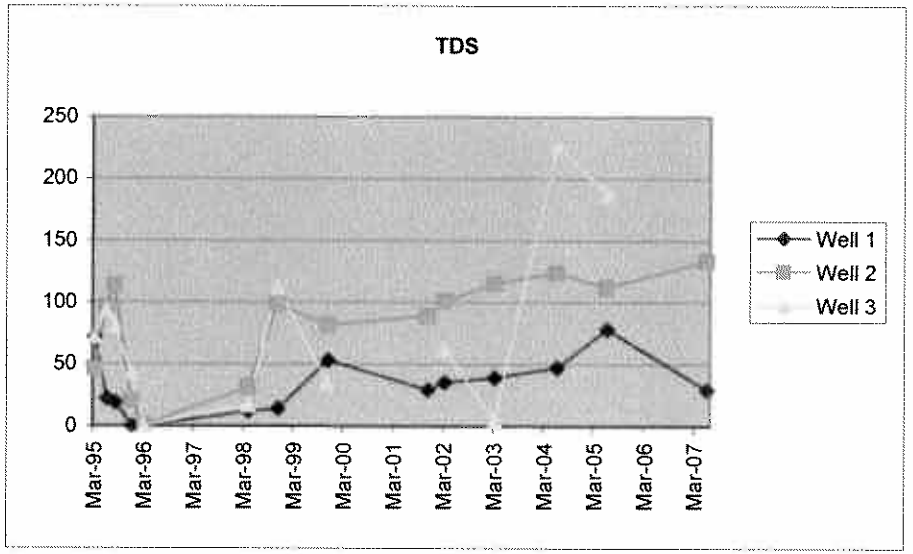
	Nitrate			TDS			Chloride			TKN		
Date	Well 1	Well 2	Well 3	Well 1	Well 2	Well 3	Well 1	Well 2	Well 3	Well 1	Well 2	Well 3
3/21/1995	1.25	0.06	1.47	72	46	72	3.7	15.2	16.8	0.26	0.45	0.62
6/20/1995	0.6	0.2	0.2	22	96	93	2.2	14.3	14.7	0.28	0.7	0.59
8/28/1995	2	0.43	0.7	19	113	80	4.5	18.1	19.1	0.66	1.4	1.8
12/4/1995	0.67	<0.1	0.24	<1	20	43	3	22	17	0.43	0.68	0.31
3/12/1996	2	0.11	0.35	<1	<1	<1	3	18	10	0.22	0.78	<1
4/28/1998	1.4	0.43	0.35	12	31	17	3	12	6	<0.10	0.62	0.37
11/17/1998	0.8	0.21	0.15	14	98	111	3	18	23	0.25	1	0.57
11/9/1999	1.6	0.37	0.47	53	81	35	3	19	9	<0.10	0.59	<0.1
11/19/2001	0.87	0.15		29	88		5	22		<0.10	0.75	
3/19/2002	0.43	0.13	1.5	35	100	62	3	24	16	<0.10	0.36	0.13
3/3/2003	1.3	0.14	0.22	39	114	5	3	19	9	<0.10	0.66	0.2
6/15/2004	0.37	0.11	<0.10	47	123	227	1	25	18	<0.50	0.79	<0.50
6/1/2005	0.21	0.19	0.17	78	111	187	3	24	20	<0.50	1	<0.50
6/5/2007	0.27	0.12		29	133		3	22		<0.50	1.1	

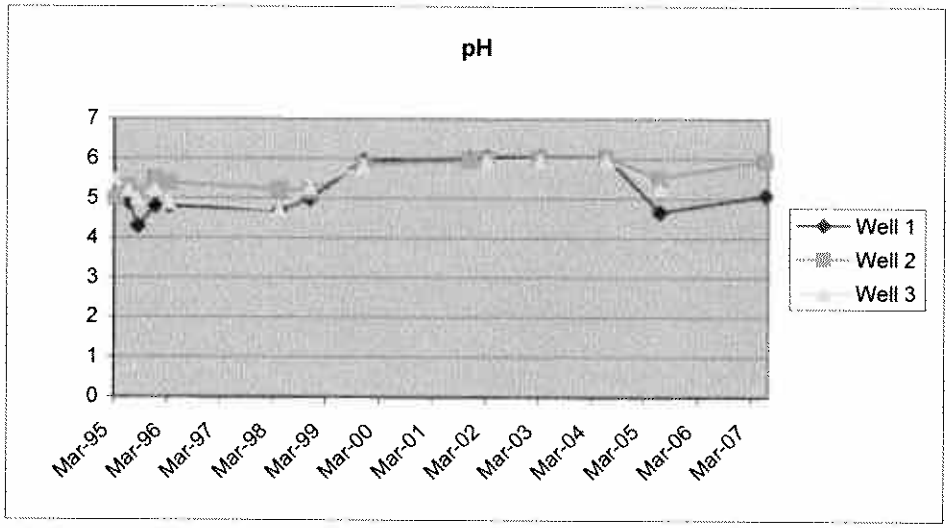
	Phosphorus			TOC			Fecal Coliform		
Date	Well 1	Well 2	Well 3	Well 1	Well 2	Well 3	Well 1	Well 2	Well 3
3/21/1995	<0.05	<0.05	<0.05	25.1	55.7	9.6	<1	<1	<1
6/20/1995	0.05	0.15	0.06	3.8	9.6	4.7	<1	6	<1
8/28/1995	0.25	0.47	0.08	5.9	13.4	5.1	<1	28	<1
12/4/1995	0.1	0.08	0.06	5.6	5.2	4	<1	1	<1
3/12/1996	<0.05	<0.05	<0.05	2	5.3	2.2	<1	<1	<1
4/28/1998	<0.05	0.1	<0.05	0.99	2.5	2.6	<1	<1	<1
11/17/1998	<0.05	<0.05	<0.05	1.1	3.6	2.8	<1	<1	<1
11/9/1999	<0.05	0.06	<0.05	1.4	4	2.5	<1	<1	<1
11/19/2001	<0.05	0.07		1.8	5.1		<1	<1	
3/19/2002	<0.05	<0.05	0.16	0.75	2.8	2.2	<1	<1	<1
3/3/2003	<0.05	0.06	<0.05	0.87	3	2	<1	<1	<1
6/15/2004	0.07	<0.05	<0.05	0.44	3.5	2.3	<1	<1	<1
6/1/2005	<0.05	<0.05	<0.05	0.76	4	3.1	<1	<1	<1
6/5/2007	<0.05	<0.05		0.36	4.46		<1	1	

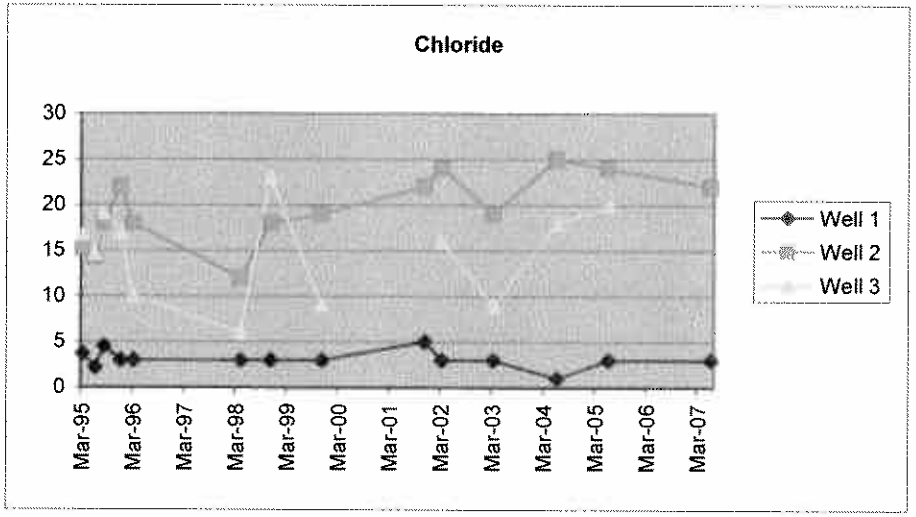
Blank means no data reported

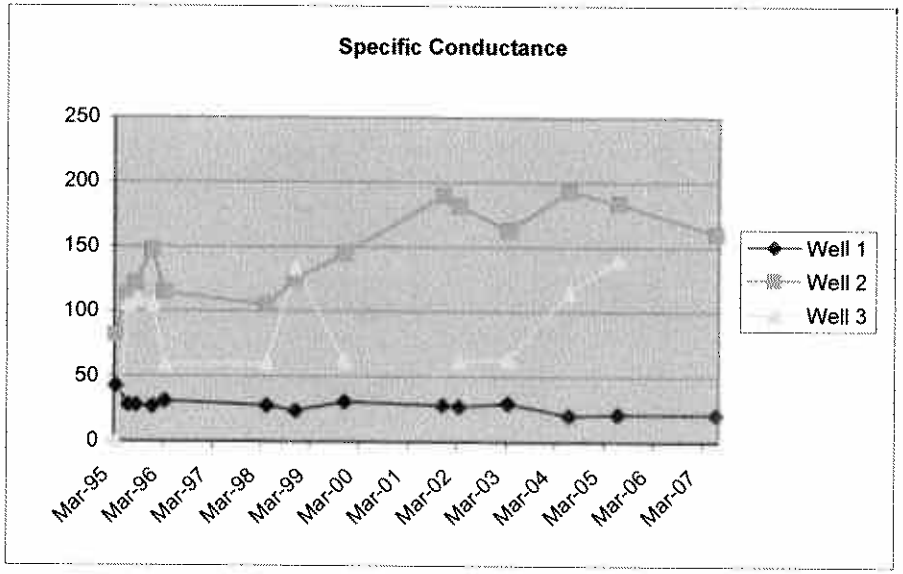
All data is in units of mg/L

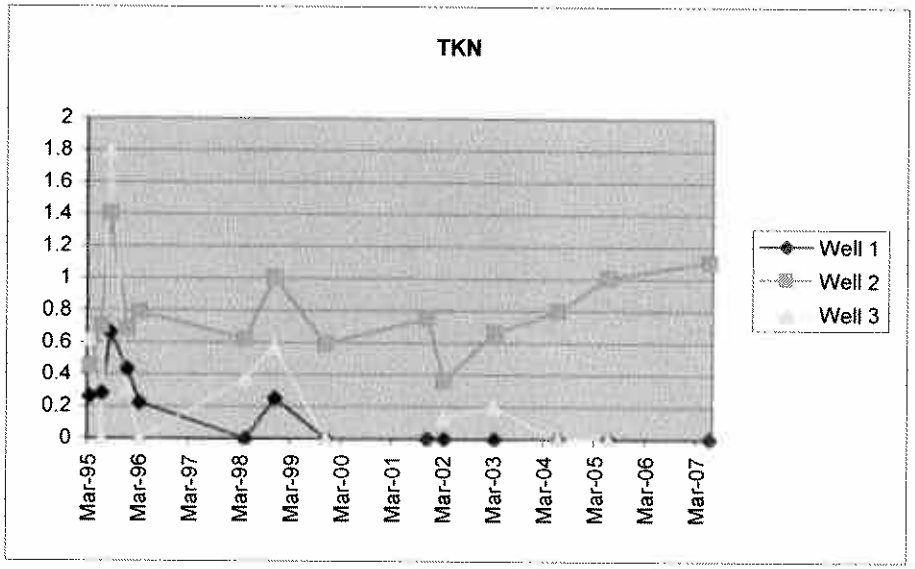

Depth
30
25
20
15
10
5
0
Mar-95
Mar-96
Mar-97
Mar-98
Mar-99
Mar-00
Mar-01
Mar-02
Mar-03
Mar-04
Mar-05
Well 1
Well 2
Well 3

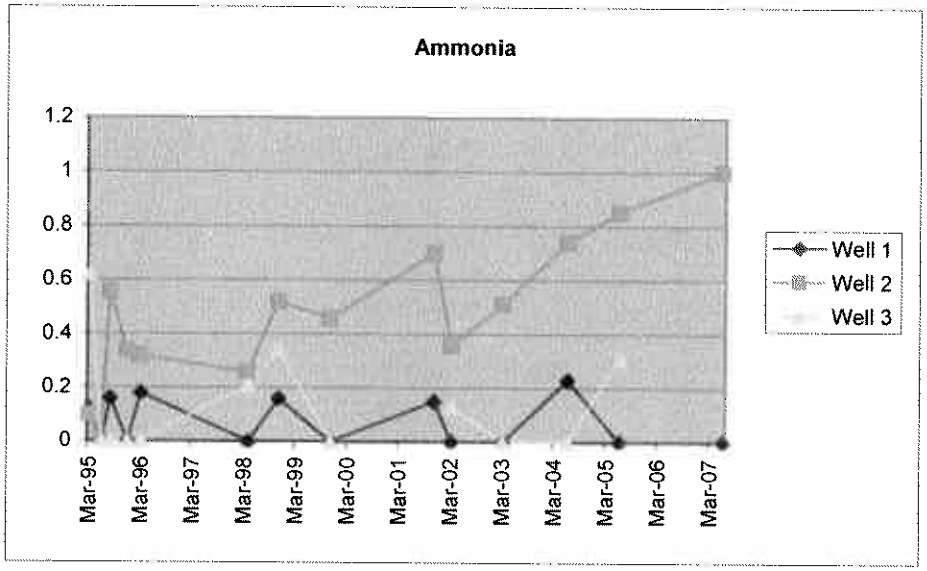

TDS
250
200
150
100
50
0
Mar-95
Mar-96
Mar-97
Mar-98
Mar-99
Mar-00
Mar-01
Mar-02
Mar-03
Mar-04
Mar-05
Mar-06
Mar-07
Well 1
Well 2
Well 3

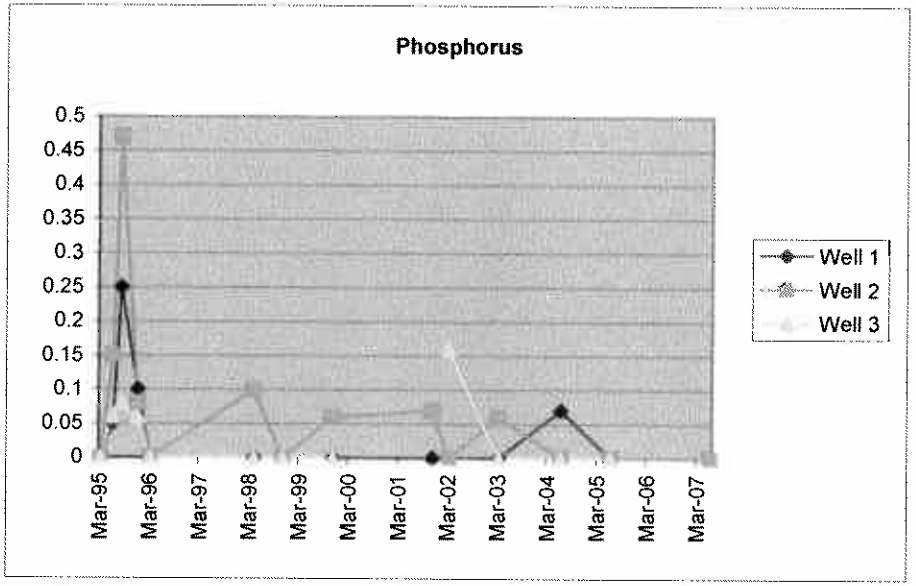

pH
7
6
5
4
3
2
1
0
Mar-95
Mar-96
Mar-97
Mar-98
Mar-99
Mar-00
Mar-01
Mar-02
Mar-03
Mar-04
Mar-05
Mar-06
Mar-07
Well 1
Well 2
Well 3

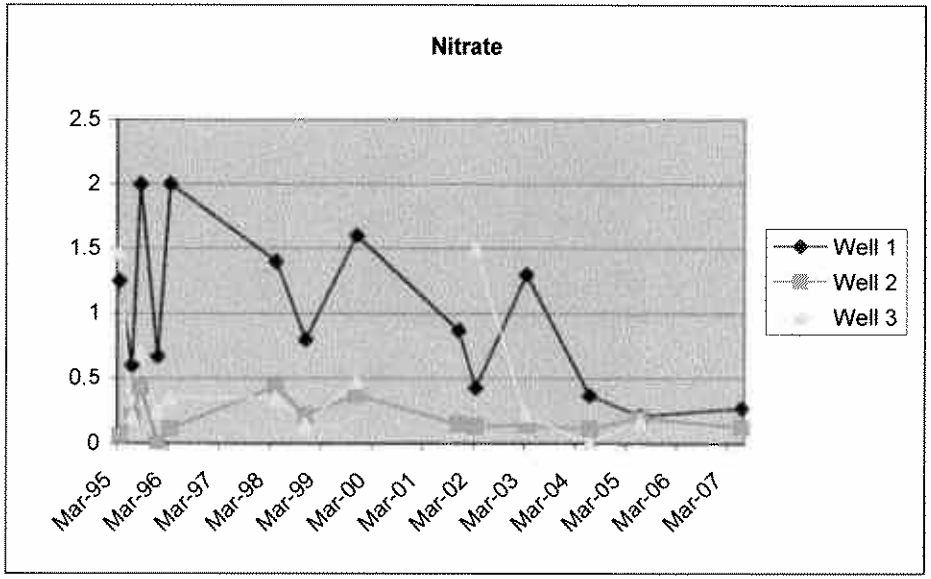

Chloride
30
25
20
15
10
5
0
Mar-95
Mar-96
Mar-97
Mar-98
Mar-99
Mar-00
Mar-01
Mar-02
Mar-03
Mar-04
Mar-05
Mar-06
Mar-07
Well 1
Well 2
Well 3

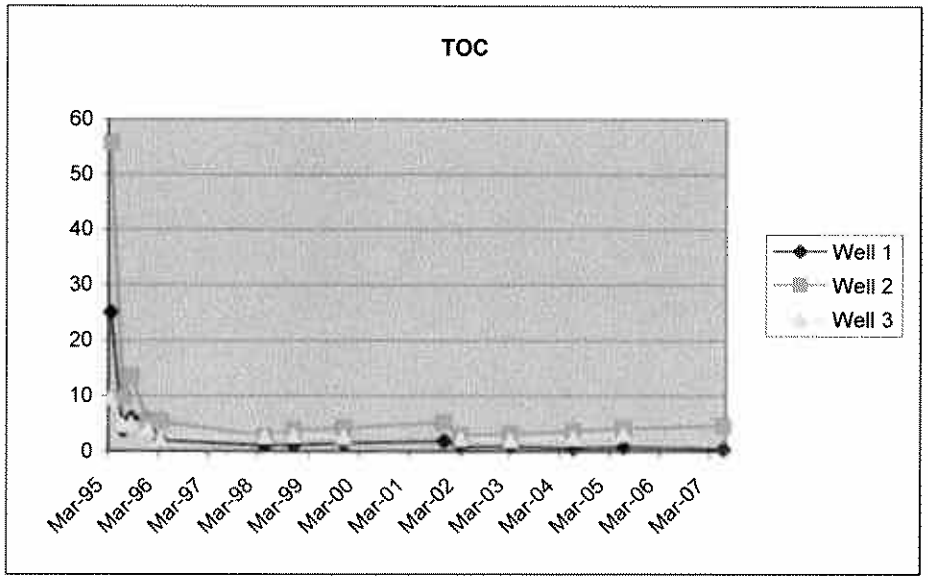

Specific Conductance
250
200
150
100
50
0
Mar-95
Mar-96
Mar-97
Mar-98
Mar-99
Mar-00
Mar-01
Mar-02
Mar-03
Mar-04
Mar-05
Mar-06
Mar-07
Well 1
Well 2
Well 3


TKN
2
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
Mar-95
Mar-96
Mar-97
Mar-98
Mar-99
Mar-00
Mar-01
Mar-02
Mar-03
Mar-04
Mar-05
Mar-06
Mar-07
Well 1
Well 2
Well 3


Ammonia
1.2
1
0.8
0.6
0.4
0.2
0
Mar-95
Mar-96
Mar-97
Mar-98
Mar-99
Mar-00
Mar-01
Mar-02
Mar-03
Mar-04
Mar-05
Mar-06
Mar-07
Well 1
Well 2
Well 3


Phosphorus
0.5
0.45
0.4
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
Mar-95
Mar-96
Mar-97
Mar-98
Mar-99
Mar-00
Mar-01
Mar-02
Mar-03
Mar-04
Mar-05
Mar-06
Mar-07
Well 1
Well 2
Well 3


Nitrate
2.5
2
1.5
1
0.5
0
Mar-95
Mar-96
Mar-97
Mar-98
Mar-99
Mar-00
Mar-01
Mar-02
Mar-03
Mar-04
Mar-05
Mar-06
Mar-07
Well 1
Well 2
Well 3


TOC
60
50
40
30
20
10
0
Mar-95
Mar-96
Mar-97
Mar-98
Mar-99
Mar-00
Mar-01
Mar-02
Mar-03
Mar-04
Mar-05
Mar-06
Mar-07
Well 1
Well 2
Well 3

Groundwater Data Analysis for Non-normal Data

Parameter	pH
Up Gradient Data	**Down Gradient Data**
5	5
4.9	5.3
4.3	5.1
4.8	5.5
4.8	5.4
4.69	5.22
4.98	5.18
5.94	5.85
6	5.94
6.04	5.97
6.05	6.01
6.05	6.03
4.66	5.52
5.08	5.95
Minimum 4.3	**Minimum** 5
Maximum 6.05	**Maximum** 6.03
Is there a significant difference?	
Lower Range	Upper Range
No	**No**

Permit Number	VA0027561
Facility Name	Children's Baptist Home of
Parameter	pH
Monitoring Well #:	2

Groundwater Data Analysis for Non-normal Data

Parameter	pH
Up Gradient Data	**Down Gradient Data**
5	5.5
4.9	5.2
4.3	5
4.8	5.2
4.8	4.9
4.69	4.71
4.98	5.28
5.94	5.81
6	
6.04	5.96
6.05	5.96
6.05	5.97
4.66	5.24
5.08	
Minimum 4.3	**Minimum** 4.71
Maximum 6.05	**Maximum** 5.97
Is there a significant difference?	
Lower Range	Upper Range
No	**No**

Permit Number	VA0027561
Facility Name	Children's Baptist Home of
Parameter	pH
Monitoring Well #:	3

Groundwater Data Analysis for Non-normal Data

Parameter	Spec Cond
Up Gradient Data	Down Gradient Data
42.6	81.7
28	113
28	121
27	147
31	114
27.6	104.9
23.8	124.5
30.6	144.7
27.9	188.8
26.9	180.9
29.4	162.5
20	192
21	183
21	160
Minimum 20	Minimum 81.7
Maximum 42.6	Maximum 192
Is there a significant difference?	
YES	

Permit Number	VA0027561
Facility Name	Children's Baptist Home of
Parameter	Spec Cond
Monitoring Well #:	2

Cochran's Approximation to the Behrens-Fisher Student's t-Test (at a 5% Level of Significance)

Permit Number	VA0027551
Facility Name	Children's Baptist Home of VA
Parameter	Spec Cond
Monitoring Well #	3
What is the number of observations in the set of background data (n_b)?	14
What is the number of observations in the set of monitoring data (n_m)?	12

	Background	Monitored Site	$[X_b-X_b(ave)]^2$	$[X_m-X_m(ave)]^2$
1	42 6	0 31	228 442	7082 485
2	28	105	0 264	421 584
3	28	109	0 264	601 844
4	27	106	0 236	463 649
5	31	59	12 350	648 594
6	27 6	59 9	0 013	603 562
7	23 8	133	13 584	2355 404
8	30 6	61 5	9 699	527 506
9	27 9	0	0 172	7134 759
10	26 9	61 8	0 343	513 816
11	29 4	63 1	3 664	456 570
12	20	115	56 036	932 234
13	21	140	42 064	0 000
14	21	0	42 064	0 000
15	0	0	0 000	0 000
16	0	0	0 000	0 000
17	0	0	0 000	0 000
18	0	0	0 000	0 000
19	0	0	0 000	0 000
20	0	0	0 000	0 000
21	0	0	0 000	0 000
22	0	0	0 000	0 000
23	0	0	0 000	0 000
24	0	0	0 000	0 000
25	0	0	0 000	0 000
26	0	0	0 000	0 000
27	0	0	0 000	0 000
28	0	0	0 000	0 000
29	0	0	0 000	0 000
30	0	0	0 000	0 000
31	0	0	0 000	0 000
32	0	0	0 000	0 000
33	0	0	0 000	0 000
34	0	0	0 000	0 000
35	0	0	0 000	0 000
36	0	0	0 000	0 000
37	0	0	0 000	0 000
38	0	0	0 000	0 000
39	0	0	0 000	0 000
40	0	0	0 000	0 000

$X_b(ave)$ = 27 486 $X_m(ave)$ = 84 468

T_b = 1 771 (from lookup table)
T_m = 1 796

s_b^2 = 31 477 = $[(X_{b1}-X_b(ave))^2+(X_{b2}-X_b(ave))^2 \ldots (X_{bn}-X_b(ave))^2]/(n_b-1)$
s_m^2 = 1976 546 = $[(X_{m1}-X_m(ave))^2+(X_{m2}-X_m(ave))^2 \ldots (X_{mn}-X_m(ave))^2]/(n_m-1)$

T_{star} = 4.410 = $[X_m(ave)-X_b(ave)]/sqrt(s_m^2/n_m + s_b^2/n_b)$

W_b = 2 248 = s_b^2/n_b
W_m = 164 712 = s_m^2/n_m

T_{comp} = 1.795663343 = $(W_b*T_b + W_m*T_m)/(W_b + W_m)$

There is a significant increase in this parameter

Cochran's Approximation to the Behrens-Fisher Student's t-Test (at a 5% Level of Significance)

Permit Number	VA0027561
Facility Name	Children's Baptist Home of VA
Parameter	Ammonia
Monitoring Well #	2
What is the number of observations in the set of background data (n_b)?	14
What is the number of observations in the set of monitoring data (n_m)?	14

	Background	Monitored Site	$[X_b-X_b(ave)]^2$	$[X_m-X_m(ave)]^2$
1	0.12	0.1	0.001	0.150
2	0.1	0.1	0.002	0.150
3	0.16	0.56	0.000	0.005
4	0.1	0.34	0.002	0.022
5	0.18	0.32	0.001	0.028
6	0.1	0.26	0.002	0.052
7	0.16	0.52	0.000	0.001
8	0.1	0.46	0.002	0.001
9	0.15	0.7	0.000	0.045
10	0.1	0.36	0.002	0.016
11	0.1	0.51	0.002	0.001
12	0.23	0.74	0.008	0.064
13	0.2	0.85	0.003	0.132
14	0.2	1	0.003	0.263
15	0	0	0.000	0.000
16	0	0	0.000	0.000
17	0	0	0.000	0.000
18	0	0	0.000	0.000
19	0	0	0.000	0.000
20	0	0	0.000	0.000
21	0	0	0.000	0.000
22	0	0	0.000	0.000
23	0	0	0.000	0.000
24	0	0	0.000	0.000
25	0	0	0.000	0.000
26	0	0	0.000	0.000
27	0	0	0.000	0.000
28	0	0	0.000	0.000
29	0	0	0.000	0.000
30	0	0	0.000	0.000
31	0	0	0.000	0.000
32	0	0	0.000	0.000
33	0	0	0.000	0.000
34	0	0	0.000	0.000
35	0	0	0.000	0.000
36	0	0	0.000	0.000
37	0	0	0.000	0.000
38	0	0	0.000	0.000
39	0	0	0.000	0.000
40	0	0	0.000	0.000

$X_b(ave)$ = 0.143 $X_m(ave)$ = 0.487

T_b = 1.771 (from lookup table)

T_m = 1.771

s_b^2 = 0.002 = $[(X_{b1}-X_b(ave))^2+(X_{b2}-X_b(ave))^2 \ldots (X_{bn}-X_b(ave))^2]/(n_b-1)$

s_m^2 = 0.071 = $[(X_{m1}-X_m(ave))^2+(X_{m2}-X_m(ave))^2 \ldots (X_{mn}-X_m(ave))^2]/(n_m-1)$

T_{star} = **4.749** = $[X_m(ave)-X_b(ave)]/sqrt(s_m^2/n_m + s_b^2/n_b)$

W_b = 0.000 = s_b^2/n_b

W_m = 0.005 = s_m^2/n_m

T_{comp} = **1.771** = $(W_b*T_b + W_m*T_m)/(W_b + W_m)$

There is a significant increase in this parameter

Groundwater Data Analysis for Non-normal Data

Parameter	Ammonia
Up Gradient Data	**Down Gradient Data**
0.12	0.62
0.1	0.1
0.16	0.1
0.1	0.1
0.18	0.1
0.1	0.21
0.16	0.34
0.1	0.1
0.15	
0.1	0.13
0.1	0.1
0.23	0.2
0.2	0.31
0.2	
Minimum 0.1	**Minimum** 0.1
Maximum 0.23	**Maximum** 0.62
Is there a significant difference?	
YES	

Permit Number	VA0027561
Facility Name	Children's Baptist Home of
Parameter	Ammonia
Monitoring Well #:	3

Cochran's Approximation to the Behrens-Fisher Student's t-Test (at a 5% Level of Significance)

Permit Number	VA0027561
Facility Name	Children's Baptist Home of VA
Parameter	Nitrate
Monitoring Well #	2
What is the number of observations in the set of background data (n_b)?	14
What is the number of observations in the set of monitoring data (n_m)?	14

	Background	Monitored Site	$[X_b - X_b(ave)]^2$	$[X_m - X_m(ave)]^2$
1	1 25	0 06	0 071	0 019
2	0 5	0 2	0 147	0 000
3	2	0 43	1 033	0 055
4	0 67	0 1	0 098	0 009
5	2	0 11	1 033	0 007
6	1 4	0 43	0 173	0 055
7	0 8	0 21	0 034	0 000
8	1 5	0 37	0 380	0 030
9	0 87	0 15	0 013	0 002
10	0 43	0 13	0 306	0 004
11	1 3	0 14	0 100	0 003
12	0 37	0 11	0 376	0 007
13	0 21	0 19	0 598	0 000
14	0 27	0 12	0 509	0 006
15	0	0	0 000	0 000
16	0	0	0 000	0 000
17	0	0	0 000	0 000
18	0	0	0 000	0 000
19	0	0	0 000	0 000
20	0	0	0 000	0 000
21	0	0	0 000	0 000
22	0	0	0 000	0 000
23	0	0	0 000	0 000
24	0	0	0 000	0 000
25	0	0	0 000	0 000
26	0	0	0 000	0 000
27	0	0	0 000	0 000
28	0	0	0 000	0 000
29	0	0	0 000	0 000
30	0	0	0 000	0 000
31	0	0	0 000	0 000
32	0	0	0 000	0 000
33	0	0	0 000	0 000
34	0	0	0 000	0 000
35	0	0	0 000	0 000
36	0	0	0 000	0 000
37	0	0	0 000	0 000
38	0	0	0 000	0 000
39	0	0	0 000	0 000
40	0	0	0 000	0 000

$X_b(ave)$ = 0 984 $X_m(ave)$ = 0 196

T_b = 1 771 (from lookup table)
T_m = 1 771

s_b^2 = 0 375 = $[(X_{b1}-X_b(ave))^2+(X_{b2}-X_b(ave))^2 \ldots (X_{bn}-X_b(ave))^2]/(n_b-1)$
s_m^2 = 0 015 = $[(X_{m1}-X_m(ave))^2+(X_{m2}-X_m fave))^2 \ldots (X_{mn}-X_m(ave))^2]/(n_m-1)$

T_{star} = -4.716 = $[X_m(ave)-X_b(ave)]/sqrt(s_m^2/n_m + s_b^2/n_b)$

W_b = 0 027 = s_b^2/n_b
W_m = 0 001 = s_m^2/n_m

T_{comp} = 1.771 = $(W_b*T_b + W_m*T_m)/(W_b + W_m)$

There is no significant difference between the monitoring data and the background data or there is a failure of the assumption made for test validity

Groundwater Data Analysis for Non-normal Data

Parameter	Nitrate
Up Gradient Data	**Down Gradient Data**
1.25	1.47
0.6	0.2
2	0.7
0.67	0.24
2	0.35
1.4	0.35
0.8	0.15
1.6	0.47
0.87	
0.43	1.5
1.3	0.22
0.37	0.1
0.21	0.17
0.27	
Minimum 0.21	**Minimum** 0.1
Maximum 2	**Maximum** 1.5
Is there a significant difference?	
NO	

Permit Number	VA0027561
Facility Name	Children's Baptist Home of
Parameter	Nitrate
Monitoring Well #:	3

Cochran's Approximation to the Behrens-Fisher Student's t-Test (at a 5% Level of Significance)

Permit Number	VA0027561
Facility Name	Children's Baptist Home of VA
Parameter	TDS
Monitoring Well #	2
What is the number of observations in the set of background data (n_b)?	14
What is the number of observations in the set of monitoring data (n_m)?	14

	Background	Monitored Site	$[X_b-X_b(ave)]^2$	$[X_m-X_m(ave)]^2$
1	72	46	1582 903	1332 250
2	22	96	104 332	182 250
3	19	113	174 617	930 250
4	1	20	974 332	3906 250
5	1	1	974 332	6642 250
6	12	31	408 617	2652 250
7	14	98	331 760	240 250
8	53	81	432 046	2 250
9	29	88	10 332	30 250
10	35	100	7 760	306 250
11	39	114	46 046	992 250
12	47	123	218 617	1640 250
13	78	111	2096 332	812 250
14	29	133	10 332	2550 250
15	0	0	0 000	0 000
16	0	0	0 000	0 000
17	0	0	0 000	0 000
18	0	0	0 000	0 000
19	0	0	0 000	0 000
20	0	0	0 000	0 000
21	0	0	0 000	0 000
22	0	0	0 000	0 000
23	0	0	0 000	0 000
24	0	0	0 000	0 000
25	0	0	0 000	0 000
26	0	0	0 000	0 000
27	0	0	0 000	0 000
28	0	0	0 000	0 000
29	0	0	0 000	0 000
30	0	0	0 000	0 000
31	0	0	0 000	0 000
32	0	0	0 000	0 000
33	0	0	0 000	0 000
34	0	0	0 000	0 000
35	0	0	0 000	0 000
36	0	0	0 000	0 000
37	0	0	0 000	0 000
38	0	0	0 000	0 000
39	0	0	0 000	0 000
40	0	0	0 000	0 000

$X_b(ave)$ = 32 214 $X_m(ave)$ = 82 500

T_b = 1 771 (from lookup table)
T_m = 1 771

s_b^2 = 567 104 = $[(X_{b1}-X_b(ave))^2+(X_{b2}-X_b(ave))^2 \ldots (X_{bn}-X_b(ave))^2]/(n_b-1)$
s_m^2 = 1709 192 = $[(X_{m1}-X_m(ave))^2+(X_{m2}-X_m(ave))^2 \ldots (X_{mn}-X_m(ave))^2]/(n_m-1)$

T_{star} = 3.944 = $[X_m(ave)-X_b(ave)]/sqrt(s_m^2/n_m + s_b^2/n_b)$

W_b = 40 507 = s_b^2/n_b
W_m = 122 085 = s_m^2/n_m

T_{comp} = 1.771 = $(W_b*T_b + W_m*T_m)/(W_b + W_m)$

There is a significant increase in this parameter

Cochran's Approximation to the Behrens-Fisher Student's t-Test (at a 5% Level of Significance)

Permit Number	VA0027561
Facility Name	Children's Baptist Home of VA
Parameter	TDS
Monitoring Well #	3
What is the number of observations in the set of background data (n_b)?	14
What is the number of observations in the set of monitoring data (n_m)?	12

	Background	Monitored Site	$[X_b-X_b(ave)]^2$	$[X_m-X_m(ave)]^2$
1	72	72	1582 903	33 063
2	22	93	104 332	232 563
3	19	80	174 617	5 063
4	1	43	974 332	1207 563
5	1	1	974 332	5890 563
6	12	17	408 617	3690 563
7	14	111	331 760	1105 563
8	53	35	432.046	1827 563
9	29	0	10 332	6045 063
10	35	62	7 760	248 063
11	39	5	46 046	5292 563
12	47	227	218 617	22275 563
13	78	187	2096 332	0 000
14	29	0	10 332	0 000
15	0	0	0 000	0 000
16	0	0	0 000	0 000
17	0	0	0 000	0 000
18	0	0	0 000	0 000
19	0	0	0 000	0 000
20	0	0	0 000	0 000
21	0	0	0 000	0 000
22	0	0	0 000	0 000
23	0	0	0 000	0 000
24	0	0	0 000	0 000
25	0	0	0 000	0 000
26	0	0	0 000	0 000
27	0	0	0 000	0 000
28	0	0	0 000	0 000
29	0	0	0 000	0 000
30	0	0	0 000	0 000
31	0	0	0 000	0 000
32	0	0	0 000	0 000
33	0	0	0 000	0 000
34	0	0	0 000	0 000
35	0	0	0 000	0 000
36	0	0	0 000	0 000
37	0	0	0 000	0 000
38	0	0	0 000	0 000
39	0	0	0 000	0 000
40	0	0	0 000	0 000

$X_b(ave)$ = 32 214 $X_m(ave)$ = 77 750

T_b = 1 771 (from lookup table)
T_m = 1 796

s_b^2 = 567 104 = $[(X_{b1}-X_b(ave))^2+(X_{b2}-X_b(ave))^2 \ldots (X_{bn}-X_b(ave))^2]/(n_b-1)$
s_m^2 = 4350 341 = $[(X_{m1}-X_m(ave))^2+(X_{m2}-X_m(ave))^2 \ldots (X_{mn}-X_m(ave))^2]/(n_m-1)$

T_{star} = **2.268** = $[X_m(ave)-X_b(ave)]/sqrt(s_m^2/n_m + s_b^2/n_b)$

W_b = 40 507 = s_b^2/n_b
W_m = 362 528 = s_m^2/n_m

T_{comp} = 1.793487354 = $(W_b*T_b + W_m*T_m)/(W_b + W_m)$

There is a significant increase in this parameter

Groundwater Data Analysis for Non-normal Data

Parameter	~~Chloride~~ chloride
Up Gradient Data	Down Gradient Data
3.7	15.2
2.2	14.3
4.5	18.1
3	22
3	18
3	12
3	18
3	19
5	22
3	24
3	19
1	25
3	24
3	22
Minimum 1	Minimum 12
Maximum 5	Maximum 25
Is there a significant difference?	
YES	

Permit Number	VA0027561
Facility Name	Children's Baptist Home of
Parameter	~~Chloride~~ Chloride
Monitoring Well #:	2

Cochran's Approximation to the Behrens-Fisher Student's t-Test (at a 5% Level of Significance)

Permit Number	VA0027561
Facility Name	Children's Baptist Home of VA
Parameter	~~Chloride~~ Chloride
Monitoring Well #	3
What is the number of observations in the set of background data (n_b)?	14
What is the number of observations in the set of monitoring data (n_m)?	12

	Background	Monitored Site	$[X_b-X_b(ave)]^2$	$[X_m-X_m(ave)]^2$
1	3 7	16 8	0 360	3 674
2	2 2	14 7	0 810	0 034
3	4 5	19 1	1 960	17 780
4	3	17	0 010	4 480
5	3	10	0 010	23 847
6	3	6	0 010	78 914
7	3	23	0 010	65 880
8	3	9	0 010	34 614
9	5	0	3 610	221 514
10	3	16	0 010	1 247
11	3	9	0 010	34 614
12	1	18	4 410	9 714
13	3	20	0 010	0 000
14	3	0	0 010	0 000
15	0	0	0 000	0 000
16	0	0	0 000	0 000
17	0	0	0 000	0 000
18	0	0	0 000	0 000
19	0	0	0 000	0 000
20	0	0	0 000	0 000
21	0	0	0 000	0 000
22	0	0	0 000	0 000
23	0	0	0 000	0 000
24	0	0	0 000	0 000
25	0	0	0 000	0 000
26	0	0	0 000	0 000
27	0	0	0 000	0 000
28	0	0	0 000	0 000
29	0	0	0 000	0 000
30	0	0	0 000	0 000
31	0	0	0 000	0 000
32	0	0	0 000	0 000
33	0	0	0 000	0 000
34	0	0	0 000	0 000
35	0	0	0 000	0 000
36	0	0	0 000	0 000
37	0	0	0 000	0 000
38	0	0	0 000	0 000
39	0	0	0 000	0 000
40	0	0	0 000	0 000

$X_b(ave)$ = 3 100 $X_m(ave)$ = 14 883

T_b = 1 771 (from lookup table)
T_m = 1 796

s_b^2 = 0 865 = $[(X_{b1}-X_b(ave))^2+(X_{b2}-X_b(ave))^2 \ldots (X_{bn}-X_b(ave))^2]/(n_b-1)$
s_m^2 = 45 119 = $[(X_{m1}-X_m(ave))^2+(X_{m2}-X_m(ave))^2 \ldots (X_{mn}-X_m(ave))^2]/(n_m-1)$

T_{star} = 6.028 = $[X_m(ave)-X_b(ave)]/sqrt(s_m^2/n_m + s_b^2/n_b)$

W_b = 0 062 = s_b^2/n_b
W_m = 3 760 = s_m^2/n_m

T_{comp} = 1.795596001 = $(W_b*T_b + W_m*T_m)/(W_b + W_m)$

There is a significant increase in this parameter

Cochran's Approximation to the Behrens-Fisher Student's t-Test (at a 5% Level of Significance)

Permit Number	VA0027561
Facility Name	Children's Baptist Home of VA
Parameter	TKN
Monitoring Well #	2
What is the number of observations in the set of background data (n_b)?	14
What is the number of observations in the set of monitoring data (n_m)?	14

	Background	Monitored Site	$[X_b-X_b(ave)]^2$	$[X_m-X_m(ave)]^2$
1	0.26	0.45	0.001	0.107
2	0.28	0.7	0.000	0.006
3	0.66	1.4	0.135	0.388
4	0.43	0.68	0.019	0.009
5	0.22	0.78	0.005	0.000
6	0.1	0.62	0.037	0.025
7	0.25	1	0.002	0.050
8	0.1	0.59	0.037	0.035
9	0.1	0.75	0.037	0.001
10	0.1	0.36	0.037	0.174
11	0.1	0.66	0.037	0.014
12	0.5	0.79	0.043	0.000
13	0.5	1	0.043	0.050
14	0.5	1.1	0.043	0.104
15	0	0	0.000	0.000
16	0	0	0.000	0.000
17	0	0	0.000	0.000
18	0	0	0.000	0.000
19	0	0	0.000	0.000
20	0	0	0.000	0.000
21	0	0	0.000	0.000
22	0	0	0.000	0.000
23	0	0	0.000	0.000
24	0	0	0.000	0.000
25	0	0	0.000	0.000
26	0	0	0.000	0.000
27	0	0	0.000	0.000
28	0	0	0.000	0.000
29	0	0	0.000	0.000
30	0	0	0.000	0.000
31	0	0	0.000	0.000
32	0	0	0.000	0.000
33	0	0	0.000	0.000
34	0	0	0.000	0.000
35	0	0	0.000	0.000
36	0	0	0.000	0.000
37	0	0	0.000	0.000
38	0	0	0.000	0.000
39	0	0	0.000	0.000
40	0	0	0.000	0.000

$X_b(ave)$ =	0.293	$X_m(ave)$ = 0.777
T_b =	1.771	(from lookup table)
T_m =	1.771	
s_b^2 =	0.037	= $[(X_{b1}-X_b(ave))^2+(X_{b2}-X_b(ave))^2 \ldots (X_{bn}-X_b(ave))^2]/(n_b-1)$
s_m^2 =	0.074	= $[(X_{m1}-X_m(ave))^2+(X_{m2}-X_m(ave))^2 \ldots (X_{mn}-X_m(ave))^2]/(n_m-1)$
T_{star} =	**5.446**	= $(X_m(ave)-X_b(ave))/sqrt(s_m^2/n_m + s_b^2/n_b)$
W_b =	0.003	= s_b^2/n_b
W_m =	0.005	= s_m^2/n_m
T_{comp} =	1.771	= $(W_b*T_b + W_m*T_m)/(W_b + W_m)$

There is a significant increase in this parameter

Groundwater Data Analysis for Non-normal Data

Parameter	TKN
Up Gradient Data	**Down Gradient Data**
0.26	0.62
0.28	0.59
0.66	1.8
0.43	0.31
0.22	1
0.1	0.37
0.25	0.57
0.1	0.1
0.1	
0.1	0.13
0.1	0.2
0.5	0.5
0.5	0.5
0.5	
Minimum 0.1	**Minimum** 0.1
Maximum 0.66	**Maximum** 1.8
Is there a significant difference?	
YES	

Permit Number	VA0027561
Facility Name	Children's Baptist Home of
Parameter	TKN
Monitoring Well #:	3

Groundwater Data Analysis for Non-normal Data

Parameter	Phosphorus
Up Gradient Data	**Down Gradient Data**
0.05	0.05
0.05	0.15
0.25	0.47
0.1	0.08
0.05	0.05
0.05	0.1
0.05	0.05
0.05	0.06
0.05	0.07
0.05	0.05
0.05	0.06
0.07	0.05
0.05	0.05
0.05	0.05
Minimum 0.05	**Minimum** 0.05
Maximum 0.25	**Maximum** 0.47
Is there a significant difference?	
YES	

Permit Number	VA0027561
Facility Name	Children's Baptist Home of
Parameter	Phosphorus
Monitoring Well #:	2

Groundwater Data Analysis for Non-normal Data

Parameter	Phosphorus
Up Gradient Data	**Down Gradient Data**
0.05	0.05
0.05	0.06
0.25	0.08
0.1	0.06
0.05	0.05
0.05	0.05
0.05	0.05
0.05	0.05
0.05	
0.05	0.16
0.05	0.05
0.07	0.05
0.05	0.05
0.05	
Minimum 0.05	**Minimum** 0.05
Maximum 0.25	**Maximum** 0.16
Is there a significant difference?	
NO	

Permit Number	VA0027561
Facility Name	Children's Baptist Home of
Parameter	Phosphorus
Monitoring Well #:	3

Groundwater Data Analysis for Non-normal Data

Parameter	TOC
Up Gradient Data	**Down Gradient Data**
25.1	55.7
3.8	9.6
5.9	13.4
5.6	5.2
2	5.3
0.99	2.5
1.1	3.6
1.4	4
1.8	5.1
0.75	2.8
0.87	3
0.44	3.5
0.76	4
0.36	4.46
Minimum 0.36	**Minimum** 2.5
Maximum 25.1	**Maximum** 55.7
Is there a significant difference?	
YES	

Permit Number	VA0027561
Facility Name	Children's Baptist Home of
Parameter	TOC
Monitoring Well #:	2

Groundwater Data Analysis for Non-normal Data

Parameter	TOC
Up Gradient Data	**Down Gradient Data**
25.1	9.6
3.8	4.7
5.9	5.1
5.6	4
2	2.2
0.99	2.6
1.1	2.8
1.4	2.5
1.8	
0.75	2.2
0.87	2
0.44	2.3
0.76	3.1
0.36	
Minimum 0.36	**Minimum** 2
Maximum 25.1	**Maximum** 9.6
Is there a significant difference?	
NO	

Permit Number	VA0027561
Facility Name	Children's Baptist Home of
Parameter	TOC
Monitoring Well #:	3

COMMONWEALTH of VIRGINIA

Peter W. Schmidt
Director

DEPARTMENT OF ENVIRONMENTAL QUALITY
Piedmont Regional Office
Post Office Box 6030
Glen Allen, Virginia 23058
(804) 527-5020

Gerard Seeley, Jr.
Regional Director

DEC 2 8 1994

Ms. Janice Mack
Children's Home of Virginia Baptist, Inc.
6900 Hickory Road
Petersburg, VA 23803

Re: Ground Water Monitoring Plan
Children's Home of Virginia Baptist, Inc.

Dear Ms. Mack:

Our staff has reviewed the updated ground water monitoring plan prepared by B & B Consultants, Inc. and submitted by letter dated September 22, 1994. All of the items outlined in our September 12, 1994 letter to Mr. Freeman Jones of B & B have been adequately addressed and the plan is approved for implementation. In accordance with the requirements of the VPDES permit for the facility, the wells must be installed and the first samples taken by the end of March 1995.

If you have any questions, please call Mr. Allan Brockenbrough at 527-5027.

Sincerely,

David K. Paylor

for Gerard Seeley, Jr.
Regional Director

AB/

cc: Mr. Freeman R. Jones, Jr., P.E. - B & B Consultants, Inc.
OECA

MEMORANDUM

DEPARTMENT OF ENVIRONMENTAL QUALITY
Piedmont Regional Office

4900 Cox Road Glen Allen, VA 23060 804/527-5020

SUBJECT: **GW Monitoring Plan, Baptist Children's Home, Inc.**

TO: **Allen Brockenbrough**

FROM: **Timothy Petrie**

COPY: **B.N. Sinha**

DATE: **November 29, 1994**

We have reviewed the updated version of the monitoring plan submitted by B. & B. Consultants, Inc. on behalf of Baptist Children's Home. The updated plan has addressed all items that were in question and the items have been deemed adequate.

If you have any further questions about this review, please see me.

B & B Consultants, Inc.

Engineers - Surveyors - Laboratory Analysts - Plant Operators
Environmental Services

121 North Mecklenburg Ave.
South Hill, Va. 23970
(804) 447-7621
FAX: (804) 447-4257

September 22, 1994

Mr. Allen Brockenbrough II
Virginia Department of Health
Post Office Box 6030
Glen Allen, Virginia 23058

RE: Groundwater Monitoring Plan
Baptist Children's Home, Inc.

Dear Mr. Brockenbrough:

Enclosed please find five (5) copies of the revised Groundwater Monitoring Wells Construction Documents and Plan of Operation for the above referenced project.

Listed in the order of your comment letter of September 12, 1994 are our responses:

1. Acknowledged.

2. Revised.

3. Revised.

Please contact me if there are any further questions.

Very truly yours,

B & B CONSULTANTS, INC.

Freeman R. Jones, Jr.

Freeman R. Jones, Jr., P.E.
Project Engineer

FRJ:kp

cc: Janice Mack - Baptist Children's Home, Inc.

GROUNDWATER MONITORING WELLS

CONSTRUCTION DOCUMENTS

FOR THE

BAPTIST CHILDREN'S HOME, INC.

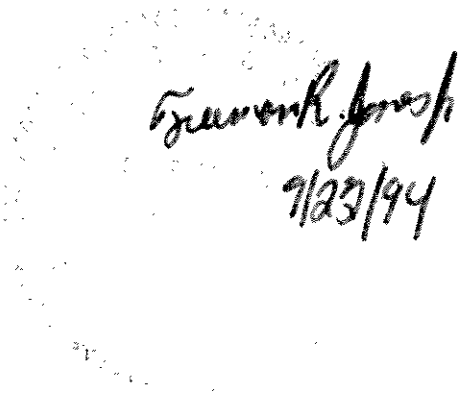
PETERSBURG, VIRGINIA

Prepared for:

Baptist Children's Home, Inc.
6900 Hickory Road
Petersburg, Virginia 23803

Prepared by:

B & B Consultants
Engineers-Surveyors-Lab Analysts-Plant Operators
121 North Mecklenburg Avenue
South Hill, Virginia 23970



December 1993
Revision 1 - 9/94

maintained. Rock & soil samples shall be taken each 10 feet using standard core drilling methods. The Contractor shall prepare a graphic boring log showing the depths of the type of soil encountered. A copy of the drawing shall be submitted to the Engineer.

2. Driller's Log: During the drilling of the well, the Contractor shall prepare and keep a complete log setting forth the following:
   a) Date/Time of construction.
   b) The reference point for all depth measurements.
   c) The depth at which each change of formation occurs.
   d) The depth at which the first water was encountered.
   e) The location and thickness of the aquifer.
   f) The identification of the material of which the aquifer is composed.
   g) The depth interval from which each water and formation sample was taken.
   h) The depth at which the bore-hole diameter changes.
   i) The depth to the static water level (SWL) and observable changes in SWL with well depth.
   j) Total depth of completed well.
   k) The depth of the surface or sanitary seal, if applicable.
   l) The nominal hole diameter of the well bore above and below the casing seal.
   m) The quantity of cement installed for the seal, if applicable.
   n) The depth and description of the well casing.
   o) Data regarding well-screen type, size, and placement in the well bore.
   p) The sealing off of water-bearing strata, if any, and the exact location thereof.
   q) Any and all other pertinent information required by the well specifications.

C. Abandonment of Wells:

1. Temporary:
   a) Any water well temporarily removed from service or completed, but not put into service, shall be sealed with a watertight cap or well-head seal.
   b) Such well shall be so maintained that it will not be a source or channel of contamination during temporary abandonment.

2. Permanent:
   a) All casing and screen materials may be salvaged.

b) The well shall be checked from land surface to the entire depth of the well before it is plugged to ascertain freedom from obstructions that may interfere with plugging (sealing) operations.

c) The well shall be thoroughly chlorinated prior to plugging (sealing).

d) Bored wells shall be completely filled with cement grout or dry clay compacted in place.

e) Wells constructed in unconsolidated formations shall be completely filled with cement grout or clay slurry by introduction through a pipe initially extending to the bottom of the well. Such pipe shall be raised, but remain submerged in grout, as the well is filled.

f) Wells constructed in consolidated rock formations or which penetrate zones of consolidated rock may be filled with sand or gravel opposite the zones of consolidated rock. The top of the sand or gravel fill shall be at least five (5) feet below the top of the consolidated rock. The remainder of the well shall be filled with sand-cement grout only.

g) Test and exploration wells shall be abandoned in such a manner as to prevent the well from being a channel for the vertical movement of water or a source of contamination to groundwater.

D. Outer Casing:
The outer casing shall be installed to a depth of at least 3 feet and extend above ground to a height of at least 24 inches. The annular space between the outer casing and the walls of the hole shall be filled with cement grout. Acceptable methods of grouting are detailed in AWWA A100-84. After drilling is completed, drilling operations shall not be resumed until grout has properly set.

E. Inner Casing and Screen:
Drilling for the inner casing shall be by an approved method at the required diameter and to the required depth to prevent caving of the hole before or during installation of the gravel pack, well screen and inner casing. The well screen and inner casing shall be lowered into the hole by a method which will allow for

control of the rate of fall at all times. The inner casing shall extend a minimum depth of 40 feet or not less than six inches in bedrock if encountered at a lesser depth. Screen length shall be a minimum of 5 feet or as long as needed to reasonably account for seasonal fluctuations of groundwater levels.

F. Gravel Pack:
The approved gravel pack shall be constructed around the screen by filling the entire space between the screen and walls of the hole in the water bearing stratum. The gravel shall be placed using a method which will ensure continuity of the gravel pack without bridging, voids, or segregation. Dumping filter gravel from the surface of the ground and agitating the well in an effort to settle the filter will not be allowed. The gravel pack shall be installed continuously and without interruption until the gravel has been placed to within 1.0 foot minimum above the top of the screen (2'-0" maximum).

G. Placing Packer:
After the inner casing, screen and gravel pack have been installed, the annular space between the inner casing and walls of the hole shall be sealed using and approved packer up to the bottom of the outer casing. The annular space between the inner and outer casing shall be filled with cement grout.

H. Well Elevation:
The Engineer will paint on the side of the well casing its top of casing elevation. The well elevation shall be submitted to the Virginia Water Control Board and the Engineer within 30 days of completion of the installation of the wells.

I. Encountering Rock:
If rock is encountered, the Contractor shall notify the Engineer.

J. Well Depth:
1. Monitoring well shall be drilled a minimum of 40 ft. deep. A minimum of 10 ft. deep saturated zone shall be found and the well screen placed within it.
2. If rock is encountered, at a lesser depth, and a 10 ft. deep saturated zone exists above the rock, then this zone shall be used. If no saturated zone is found, the well shall terminate 6" into rock.

K. Decontamination:
It is the responsibility of the driller to decontaminate

the drilling equipment. Steam decontamination procedures shall be followed before use and between borehole locations to prevent cross contamination of wells. Every precaution shall be taken to prevent distribution of contaminants between boreholes.

L. Well Drilling:

1. Well drilling shall be by 6.25" I.D. and 10 1/2" O.D. Hollow-Stem Continuous Flight Auger under unconsolidated soil conditions.
2. When consolidated rock is encountered, air rotary drilling shall be used. The compressed air from the rig should be filtered to ensure that oil from the compressor is not introduced to the borehole. Foam or joint compounds for the drill rods should not be used due to the potential for introduction of contaminants into the hydrogeologic environment. When air rotary is used, shrouds, canopies, bluooey lines, or directional pipe shall be used to contain and direct the drill cuttings away from the drill crew.

M. Material Volume:

The precise volume of filter pack and sealant required shall be calculated to establish correct subsurface distribution. The actual volume of materials used shall be determined during well construction. Discrepancies between calculated volumes and volumes used require explanation in the report of well design and construction.

N. Well Development:

1. After constructing monitoring wells, natural hydraulic conductivity of the formation shall be restored and all foreign sediment removed to ensure turbid-free ground-water samples.
2. The techniques for developing a well which require reversals or surges inflow to avoid bridging by particles, include using surge blocks, bailers, or pumps. Formation water should be used for surging the well. In low-yielding water-bearing formations, an outside source of water may sometimes be introduced into the well to facilitate development. This water shall be potable water.
3. The developed well shall be clay and silt-free. The well shall be bailed in the amount of 4 well volumes. If the groundwater is still not turbid-free, additional bailing is required until achieved.

END OF SECTION